MECHANICS · AUTOS · HOME IMPROVEMENTS

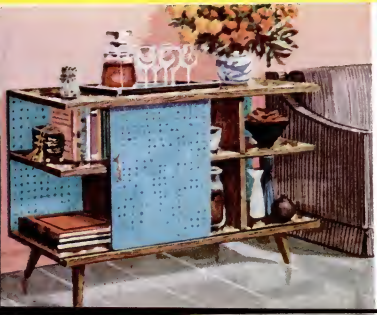
POPULAR SCIENCE

September 35c

MONTHLY

Make Your Home a Show Place

PAGE 99



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Here's power and performance that exceeds any sander in its price class. 25 square inches of sanding area • Straight-line action—no bucking; sands and polishes *with the grain;* goes all the way into corners • Less than 3" high—fits into tight places • Practically *impossible* to stall • Takes the irk out of work for only $14.95

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Here's everything you need for scores of home repair and hobby jobs. Kit contains: 100 watt Soldering Gun with instant heat, dual spotlights, and low-cost replaceable tip features; supply of famous Kester Solder; Soldering Brush for cleaning connections; Soldering Aid for opening old joints, twisting wire, etc. . . . all in a sturdy cardboard case for only $7.95.

Ask Your Hardware Dealer For A Demonstration, Or Write Direct For Catalog Bulletins.

Weller

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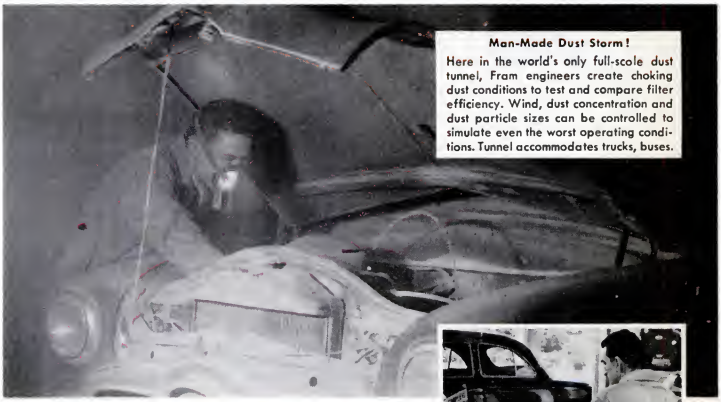
How FRAM research works to save your engine's life!



Man-Made Dust Storm!

Here in the world's only full-scale dust tunnel, Fram engineers create choking dust conditions to test and compare filter efficiency. Wind, dust concentration and dust particle sizes can be controlled to simulate even the worst operating conditions. Tunnel accommodates trucks, buses.

Scientists and engineers pioneer filter progress at FRAM Institute

The Fram Institute of Advanced Filter Research and Design at Dexter, Michigan, is the leading research center of its kind in the world. Here, FRAM scientists and engineers study new filtration materials and methods . . . test new filter systems in the giant FRAM Dust Tunnel and in actual road tests.

FRAM engineers also join with automotive manufacturers in designing special filter systems for new vehicle and engine models. This work at the FRAM Institute is behind every FRAM product you buy—helping to save your car's engine from excessive wear. When you change your oil and filter, be sure you insist on the finest in scientific filtration—always ask for genuine FRAM.

FRAM FIRST...in Research... in Protection...in Quality...in Preference

FRAM CORPORATION, Providence 16, R.I. Fram Canada Ltd., Stratford, Ont.

Test Results Prove Filter Value

After test runs as long as 40 hours, each engine is completely disassembled and each part carefully weighed and studied. The amount of wear on vital parts such as rings, bearings and cylinders determines the efficiency of the filter being tested.

Tests Lead to Improved Designs

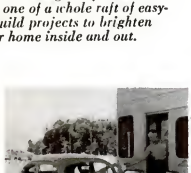
At the drawing board, test findings shape new and improved filter designs for even greater engine protection. This never-ending project of research, testing and design at the Fram Institute guarantees you the finest filter products possible.

Founded in 1872 Vol. 169: No. 3 *Mechanics and Handicraft* REG. U. S. PAT. OFF.

Popular Science Monthly

September, 1956

This stunning entry divider is just one of a whole raft of easy-to-build projects to brighten your home inside and out.



Little $1,495 VW challenges $10,000 Continental's time from Chicago to New York

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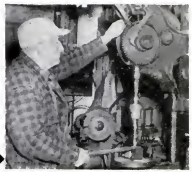

One hobby led to another for dairy farmer Carl Daniels. Now he rides herd on a dozen.

FOR THE HOME MECHANIC

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Papa-plus-Mama power propels a bicycle built for four.

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PS Readers

TALK BACK

Applause for Tesla Story

The editors of POPULAR SCIENCE are to be sincerely complimented on their treatment of the life of Nikola Tesla which appeared in the July issue (p. 81). Pictures (and likewise picture narratives) on Tesla have not been easy for the interested reader and student to find; and so, judged from a very practical point of view, this article may rightfully be considered one of the outstanding contributions to periodical literature for the Tesla centennial anniversary.

LELAND I. ANDERSON, Director
The Tesla Society, Minneapolis

Life in a Space City

If the gravity wheel in that city in space (May, p. 92) rotated at a constant velocity, a family living in one part of the wheel would have a lighter sensation of weight than their neighbors living farther from the hub. Wouldn't this make life rather confusing?

WILLIAM DAY, Marblehead, Mass.

It sure would. Centrifugal force would tend to throw people outward, away from the gravity wheel's hub, and residents would live with their heads pointed toward the hub. The closer to the hub, the smaller the pull, until finally, at dead center, even the fattest lady in the space city would be weightless.

Nice-Riding Rod

Here is a picture of the outboard hot rod that I built from your March plans. It was a very easy boat to make, and it really rides nice. I hope to win a few races with it this season.

GEORGE R. HUFF JR., Rockwell City, Iowa

A Fly-Sprayer Touches Up His Car

Your article in July on "Quick Touch-ups Keep Your Car Looking New" (p. 159) mentioned using a spray gun for older cars when you are unable to get a pressurized can of paint.

For some time now I have been using an ordinary fly-sprayer purchased for 20 cents.

I thin the paint same as for my big sprayer. Then I pump the handle steady and get a finish as good as any professional job. Works just as well with primer, too.

PHILIP EYLES, Niagara Falls, Canada

First Steam Cats

Your June article on the *Forrestal's* steam slingshots (p. 124) is very interesting, but the first U.S. carrier to sport them was the *Hancock*. We installed two up here at the Bremerton yard.

As to the angled deck, the *Antietam* had an experimental angled deck installed in December, 1952.

VINCENT PESCE, Seattle

The *Hancock* is the first U.S. carrier with steam catapults. She has had steam cats since 1953. The second to get steam cats was the *Intrepid*, in 1954. The third was the *Ticonderoga*.

Even though the *Hancock* was the first, the *Intrepid* claims a first, too. The *Han-*

Don't drive a sluggish car...

GO with that "new car feel"...

Your car *CAN* be a joy to drive! Bring back that grand "new-car feel" with an alert, responsive engine—see your Doctor of Motors for a power-restoring overhaul with Perfect Circle 2-in-1 Chrome piston rings.

In PC's 2-in-1 Chrome set,* the top compression ring was specially designed to perform where pressures are greatest, heat is highest, and lubrication is poorest. The new Type "98" oil ring with self-expanding spacer assures a uniform pressure against the cylinder wall, plus a side sealing action on the ring groove. Both rings are plated with thick, solid chrome that resists wear, more than doubles the life of cylinders, pistons and rings.

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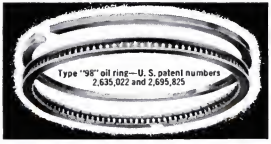

Better Mechanics everywhere install

2-in-1 Chrome piston rings...***The Standard of Comparison***

Perfect Circle Corporation, Hagerstown, Ind.; The Perfect Circle Co., Ltd., Don Mills, Ont.

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Crescent's No. P210 Utility Plier is completely new... revolutionary! Not a "slip-joint" plier, not to be confused with conventional lap-joint "pump" pliers. Its **double-strong box joint design is absolutely unique. It will grip flat, square, hex or round objects with powerful leverage. Handsomely finished in rust-resistant zinc plate.**

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cock's were built in Great Britain, while the *Intrepid's* were the first American-built set.

DENNIS J. BENJAMIN, ET2
J. D. MCFARLAN, AG3
USS *Intrepid* CVA 11

Table for Midgets?

Who's that patio table in the June issue for—midgets? I cut the 14′ length into four 36″ pieces as the book said, and had 2′ of waste. When I cut the ends at 50°, I had

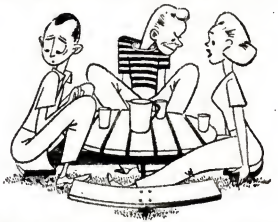

table legs so short there's no leg room under the top for us humans.

GEORGE R. SHULZE, Hopkins, Minn.

The text should have said "Cut four 36″ pieces at a 50° angle," instead of "Cut four 36″ pieces . . . and trim to a 50° angle," which of course leaves them far short of 36″.

Family? Sports?

I object to the use of "family sports car" in your article in the July issue about the Plymouth Fury ("Family Sports Car Blends Style and Zip," p. 74). Admittedly the Fury is a very hot car and handles very well but it is definitely *not* a sports car.

ROBERT NORTON, Placerville, Calif.

. . . What do you mean, *family* car? When I take my brood out for a Sunday drive, I don't have to get up to 60 m.p.h. in 10 seconds or pass every car on the road. When Detroit makes cars again like my '51 Dodge, they can talk of "family" cars.

K. WIRT, Freeport, N. Y.

That Rolling Tombstone Ball

Once I saw a similar case to your tombstone ball that had rotated on its base (July PSM, p. 224).

My father-in-law had a logical explanation: On winter days, when the temperature fluctuates from above freezing to below, water from rain or melting snow seeps into the cup under the ball. When this freezes

This man is a "security risk"!

Age, 29. Married. Two children. High school education. Active in local lodge, church, veterans' organization. Employed by large manufacturing concern. Earns $82 a week.

SOUNDS like an Average Joe. And he is. Too average! He's got a job. It pays fairly well. He's satisfied.

But here's the catch. With the right kind of training, this young man could be stepping into better jobs. He could be making $7-8000 a year. He could be cashing in on those spare-time hours he now wastes.

As it stands now, he's stuck in his job. Can't seem to make any headway. He's reluctant to try. So he just hangs on.

This man is a "Security Risk" to his wife and children.

His family probably will never enjoy the comforts, the prestige, the good living that could be theirs. If hard times come, they are almost sure to be hurt. For an Average Joe can't expect to compete with trained men when the chips are down.

A man like this would do well to start a planned program of self-improvement. In his spare time. In a field related to his interests and abilities. Right NOW!

One good way to start—a way proved by hundreds of thousands of once-Average Joes who are making good today—is to enroll for special training with a recognized correspondence school. One like I. C. S., the oldest and largest in the world.

Don't *you* be a "Security Risk." Mail the coupon for full, free details while there is still time.

For Real Job Security—Get an I. C. S. Diploma! **I. C. S., Scranton 9, Penna.** Member, National Home Study Council

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Occupation_____

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it expands and raises the ball slightly. Next the sun warms the ball on one side, melting the ice there, and causing the ball to settle down on that side, rocking slightly on the fulcrum of unmelted ice on the other side.

R. W. Bretthauer, Riverton, N. J.

. . . As the sun's rays strike it, the granite of both base and ball expand very slightly on one side. This one-sided bulging would rotate the ball away from the sun.

R. W. Dykeman, Chicago, Ill.

QWERTYUIOP Wins

Whatever happened with that new typewriter-key arrangement—the one that substituted PYFGCRL for QWERTYUIOP (PSM, Apr., p. 132)? Is the Government adopting it?

R. C. McKeever, New York

. . . I'm in favor of any system that'll keep my secretary from typing my name "Arhtur Smiht" instead of

Arthur Smith, Philadelphia

Latest word is that the Government has turned down the Dvorak typing system. Typists using the new keyboard, says the General Services Administration, typed less accurately than those using standard keyboards, and it took at least 100 hours to train them in its use.

Traveling Shower

Your camping-equipment article in the June issue (p. 79) reminded me of something I've found very handy. I took an old gasoline tank, washed it out well, and mounted it on the roof carrier of my station wagon. A pipe adapter screwed in the outlet lets me connect 25 feet of garden hose to it.

On trips, I fill the tank with water every morning. If the wagon is in the sun, soon the water is warm enough for washing.

Robert C. Wagnitz, Northfield, Ohio

New greaseless way to keep your hair neat all day

Billy Pierce took a shower.. ..then he used Vitalis

White Sox lefthander Billy Pierce rarely goes to the shower before the game ends.

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New Vitalis keeps hair in place and prevents dryness with V-7, the *greaseless* grooming discovery. You never have an over-slick, plastered-down look. Try it. You'll *like* it.

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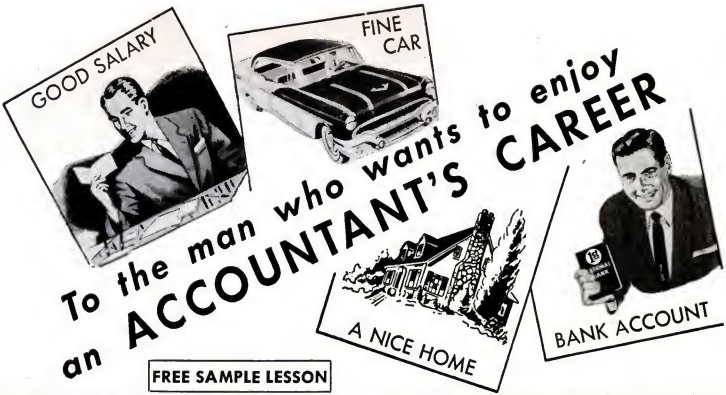

To the man who wants to enjoy an ACCOUNTANT'S CAREER

FREE SAMPLE LESSON

IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period? Always provided that the rewards were good—a salary of $4,000 to $10,000 and up?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an Accounting position?

Just suppose you were permitted to work in an accounting firm under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then more difficult ones. If you could do this—and could turn to him for advice as the problems became complex — soon you'd master them all.

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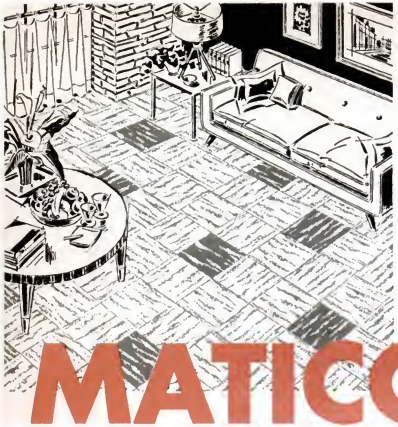

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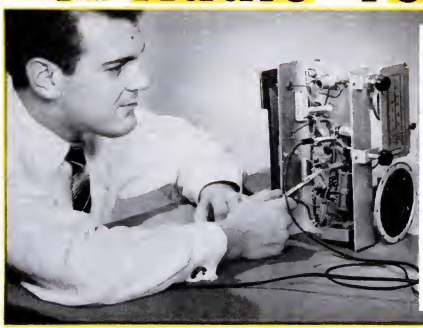

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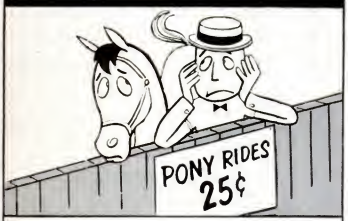

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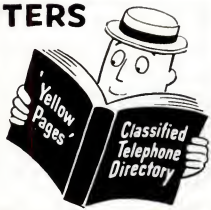

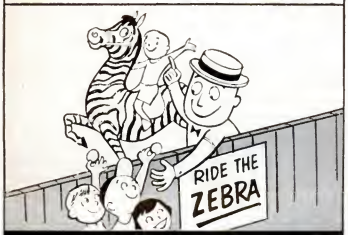

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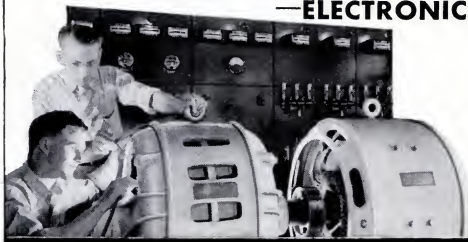

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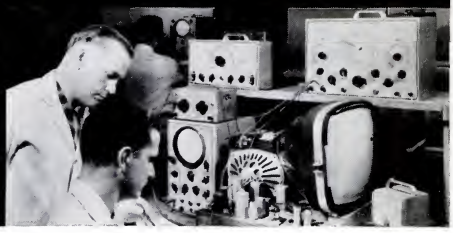

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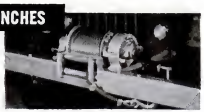

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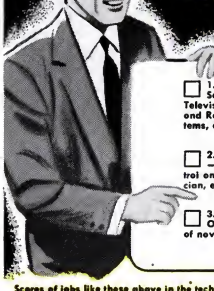

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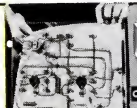

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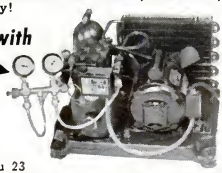

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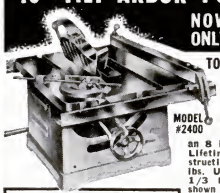

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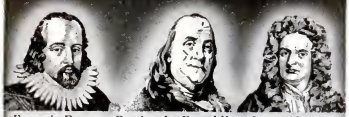

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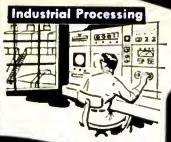

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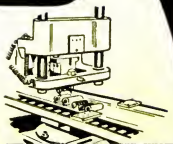

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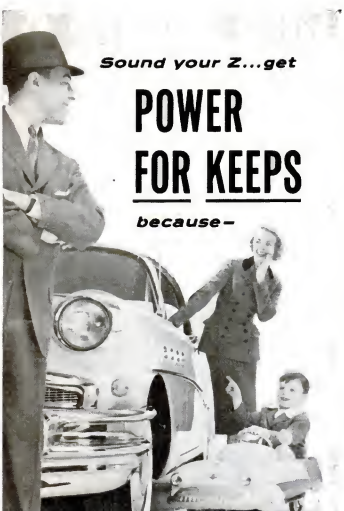

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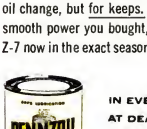

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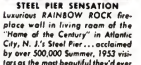

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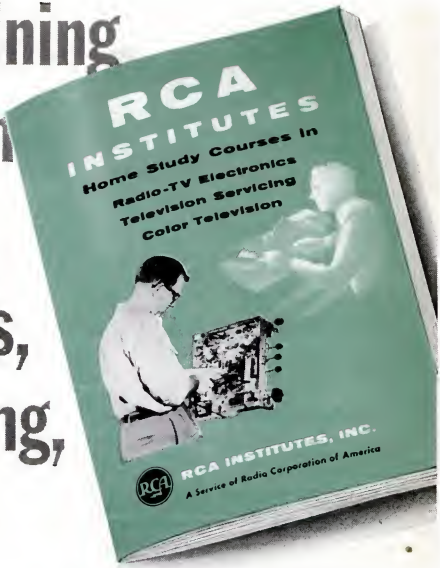

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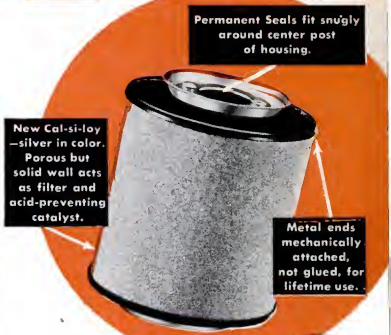

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1. This is entirely a contest of numbers, strictly a Game of Skill. Add together the numbers that make up the drawing of the Mallard and get the SUM TOTAL of the figures. The picture is made up of single digits: 2, 3, 4, 5, 7, 8 and 9. There are no sixes, no ones, no zeros. There are no double numbers like "23," etc. Just add 2 plus 3 plus 5, etc., and get the TOTAL. There are no tricks to this puzzle, just a problem in addition. It is not so easy but if you are careful you may get it exactly right. Only persons sending a $5.00 contribution to our Scholarships Program are eligible for these Cash Prizes. No additional donation will be required at any time during the contest. Checks and Money Orders should be made payable to 'SCHOLARSHIPS, INC.' Send cash if you prefer. Write us for additional puzzle sheets if you need them.

2. If you send your contribution before the date printed on the entry blank you will qualify for the $500 Promptness Bonus, making the total First Prize $2000.00. The Promptness Bonus will be added to the first prize only.

3. You should check and recheck your solution carefully before mailing. Once it has been sent it may not be changed or withdrawn. A contestant may submit an additional entry in this contest with an improved score provided each such entry is accompanied by the required $5.00 contribution. We will acknowledge receipt of your entry and contribution promptly. Read the rules carefully. Please do not write for additional information concerning this contest since information that is not available to all other contestants cannot be given.

4. This contest is confined to persons within the continental limits of the United States. Persons directly connected with Scholarships, Inc. and members of their immediate families are ineligible. Due to the uncertainty of mail address entries are not recommended from persons in the Armed Forces. Entries will not be accepted from persons in Alaska, Canada, Hawaiian Islands and other locations outside of the United States proper.

5. Entries will be accepted from July 1 to October 10, 1956. Entries postmarked October 10 will be accepted.

6. In case of ties on this Mallard Puzzle the winners will be decided by a tie-breaker number puzzle consisting of drawing a path across a chart of numbers to arrive at a high total. The contestant's position in the winning list will be determined by the best scores submitted; the best answer will receive First Prize, the second best answer will receive Second Prize, etc. In case of ties on the tiebreaker puzzle, prizes will be reserved for the positions of tied contestants and their final order of finish determined by additional tiebreaker puzzles until a definite winner for each prize is chosen. Seven days will be allowed for working the first tiebreaker puzzle and three days for each subsequent tiebreaker. If ties remain after seven tiebreaker puzzles, duplicate prizes will be paid.

(continued)

PRIZE CONTEST continued

7. It is permissible for any contestant to receive help from their relatives or friends but ONLY ONE SOLUTION may be submitted to the tiebreaker puzzle by any group working together, and any solution known to have been submitted in violation of this rule will be rejected.

8. A complete report of this contest including the names of all winners will be mailed to every contestant just as soon as the winners have been decided. The sponsors of this contest reserve the right to decide any questions that may arise during the contest and persons who enter agree to accept these decisions as final.

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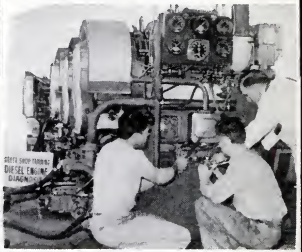

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700-16	9.50	760-15	9.90	700-16 (6)	12.52	750-20	26.20
640-15	9.56	800-15	9.85	700-15 (6)	12.53	825-20	26.10
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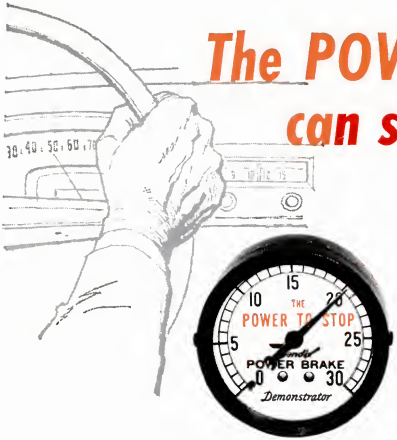

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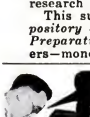

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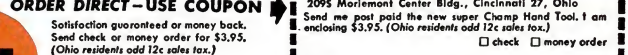

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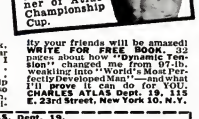

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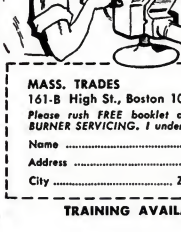

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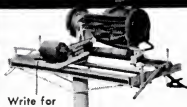

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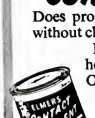

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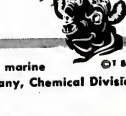

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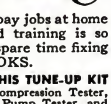

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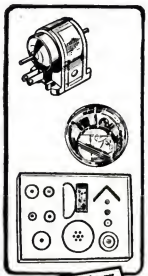

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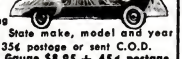

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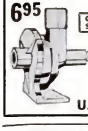

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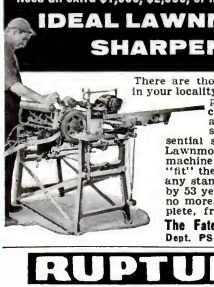

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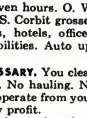

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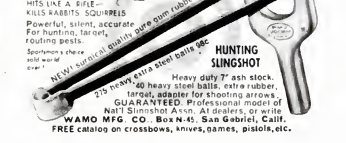

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640x15	5.68	750x16(6)	8.98	650x20	10.88	1000x20	19.98
650x16	5.78	800x15	6.88	700x20	12.88	1000x22	21.98
650x16(6)	6.98	820x15	7.48	700x17	6.98	1100x20	20.98
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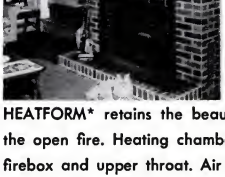

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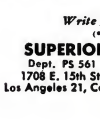
HEATFORM adds but little to the fireplace cost. It consists of firebox, throat, smoke dome, and properly operated damper, replacing some materials and labor necessary with the ordinary fireplace. Fuel savings will more than offset the small extra cost.



Model "S" HEATFORM affords view of fire from front and either side.

Write for free illustrated brochure

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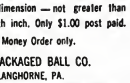

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Protect your overhead garage doors from freezing, splintering, slamming—with OVERHEAD GARAGE DOOR CUSHION.

WINTER

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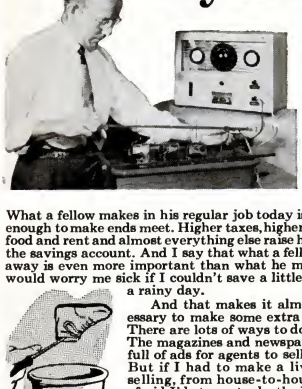
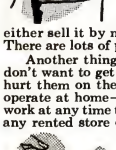
I call this machine "My Little Money Maker"



It can be put anywhere in the house—in the kitchen, the basement, or the attic and it goes on making money for you whether you're there or not. Three times a day—while you're at work, while you're asleep, or at the movies—it turns out a product that sells for $6 and the cost of raw materials is only 54c. It will make 6 a day, and the profit on each is more than $5.00. I'll be glad to tell you how to get one of these little money makers working for you.

What a fellow makes in his regular job today is hardly enough to make ends meet. Higher taxes, higher costs of food and rent and almost everything else raise hob with the savings account. And I say that what a fellow puts away is even more important than what he makes. It would worry me sick if I couldn't save a little against a rainy day.



And that makes it almost necessary to make some extra money. There are lots of ways to do it, too. The magazines and newspapers are full of ads for agents to sell things. But if I had to make a living by selling, from house-to-house, I'm afraid I'd starve to death. I like to make something with my hands and either sell it by mail or let the stores sell it for me. There are lots of people like me.

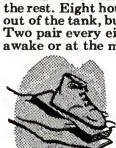
Another thing: Lots of men—and women, too—don't want to get mixed up with something that might hurt them on their jobs. They want a plan they can operate at home—in spare time—one that they can work at any time they please and one that doesn't need any rented store or hired help. And that's where my little money maker rings the bell.

Let's say you're like me. You want to make some extra money but you don't want to do any selling. All right—take a look at what you can do with this machine. I'll give you some facts that I discovered and your own common sense will tell you they're true.

If you're going to make something, it ought to be something that lots of people want—something that lots of people buy. It shouldn't be something that sells at just certain seasons—but all year round. And, it shouldn't be any flash in the pan. It's got to be steady—year after year—something that's not here today and gone tomorrow.

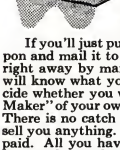
Well, give a thought to this: What's more permanent than babies? Ever since I can remember there's been more and more babies born every year. Last year three and a half million. This year more. Next year, more yet. Then answer this question and tie it in with your thinking: What's stronger than mother's love for her baby? And what is more powerful than love or sentiment in making people buy things. Now you've got the idea.

Every year millions of mothers want their babies' first shoes preserved as mementos. These mothers have the shoes "bronzed" as they call it—by electroplating. Electroplating coats the shoes with copper and preserves them forever. And there's no big company that has a corner on the business of metalizing baby shoes. Almost all of this work is done by little fellows in their kitchens



or basements. Lots of orders come to you by mail when you send out circulars letting mothers know you can do the work. Lots of stores take orders, but they have to turn the work over to you. There are six or seven ways to get orders without making any house-to-house calls. The big job is keeping up with them.

You see, you can clean up six pair shoes in a few minutes. In a few minutes more you can dip them in the hardening solution like you see in the picture. Then you spray them with a conductive coating and hang two pair in the tank on copper wires. Just turn the switch and walk away. The machine does the rest. Eight hours later those shoes are ready to take out of the tank, burnish and mount and ship or deliver. Two pair every eight hours, whether you are asleep, awake or at the movies. The materials cost 54c a pair.



The retail price you get for electroplating is $6.00—so the profit is more than $5.00 a pair. Since you can do six pair a day you can see what the profit is, and the beauty of it is that the machine doesn't cost much. Almost anyone can afford the equipment. The book tells how to run the machine and how to get orders without house-to-house selling.

If you'll just put your name and address on the coupon and mail it to me, I'll send you all the information right away by mail. After you have read all this you will know what you want to do. It will be easy to decide whether you would like to have a "Little Money Maker" of your own. Everything I send you now is free There is no catch to it and nobody will call to try to sell you anything. I'll send everything free and postage paid. All you have to do is mail the coupon, get the facts and then decide. Mail the coupon right away so I can help you get started making money.

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TAPE recorders, tape. Unusual values. Free Catalog. Dressner, 69-02 174 Street, Flushing 65, New York.

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TRAVELLERS—Name the spot—we have the slide! 4000 2x2 slides and 1200 stereos. Kodachrome sent on approval. Send 25c (deductible from first order) for 40-page illustrated catalog. Ernest L. Wolfe, 1315 Westwood, Los Angeles 24, California.

FREE! Blackhawk's big sale catalog new and used 16mm., 8mm. films; 2"x2" color slides; used 16mm. sound projectors. Biggest stock in USA. Blackhawk Films, 1701 Eastin, Davenport, Iowa.

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34 CAMERAS, PHOTO SUPPLIES

20 TO 75% discounts everything photographic, giftware. Free catalogue. Dart, 3812R Atlantic Avenue, Brooklyn 24, New York.

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BUY wholesale nationally advertised cameras, photo supplies, thousands other products at big discount. Free "Wholesale Plan." American Buyers, Hertel Station, Buffalo 16-P, N. Y.

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FREE Records of your songs—Your words—My Melody. Free information. Johnny Mack's Melody Mart, 1094 West 39th Street, Dept. K, Los Angeles 37.

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SONGPOEMS and lyrics wanted. Mail to: TinPan Alley, Inc., 1650 Broadway, New York 19, N. Y.

POEMS Wanted For New Songs. Send Poems. Free Examination. Immediate Consideration. Songcrafters, Arcade Station, Nashville, Tennessee.

SONGWRITERS! Protect your ideas! Hold all poems, songs! Write for safe, correct procedure! Song Service, Dept. PS, 333 W. 56th, New York 19.

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SONGS And Poems wanted. Records made. Five Star Music Masters, 646 Beacon Building, Boston.

PHONOGRAPH Records Cheap. Catalogue. Paramount, SD-313 East Market, Wilkes-Barre, Pennsylvania.

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YOUR Magic Hour and six other good songs for $1.50. Lucky Seven Song Service, 136 Marsden St., Springfield 9, Massachusetts.

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36 RADIO, TELEVISION, SUPPLIES & EQUIPMENT

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"20 CRYSTAL Set Plans" (SW record 5800 miles) and Experimenter's catalog—25c. Laboratories, 328-T Fuller, Redwood City, California.

ELECTRONIC Brain, build and study at home. E.B.E., 1015 Atkin Ave., S.L.C. 6, Utah.

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FREE Literature Potential Radio. 446 Crown Street, Brooklyn 25, New York.

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$10.00 PER hour net profit in monument cleaning business. Free Details. X-Pert Monument Cleaning Company, 466 Potomac Avenue, Buffalo 13, New York.

NEW mail order method. Details. Chester, Box 865-A, Sea Cliff, New York.

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MAKE Profitable Products—Sell Mail-order—Catalogue free. International, 6347 Parnell, PS9, Chicago 21, Illinois.

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PREPARE Advertising Letters, mail to our name lists. $50 weekly possible. Adams, 11603-N Paramount, Downey, California.

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IF you have a product or service that can be operated on a mail order basis, write me today. I will send you a Free Kit on "How To Make Money Out Of Classified Advertising." Next issue will be November. Closing date September 25. Hurry—Do it Today! O. K. Kelly, Classified Adv., Mgr., Dept. A9, 353 Fourth Avenue, New York 10, N. Y.

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EARN Money immediately repairing electric clocks without experience. $3. investment. Details Free. H. Puthuff, Box 1504, Santa Rosa, California.

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MAKE $100.00 weekly mailing catalogs. Cash commissions paid. Details, 2342 Washington, Chicago 12, Illinois.

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MEN and women wanted to start home business in spare time with little table-top rubber stamp machine. Easy to earn up to $9.80 an hour without previous experience. Full particulars Free by mail. Send postcard to Roberts, 1512 Jarvis, Room 89, Chicago 26, Ill.

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FREE Catalog! Nationally advertised Watches, Jewelry, Appliances, Gifts. Buy Wholesale for Personal Needs or Resale. Louis Perloff, Dept. PS, 733 Walnut Street, Philadelphia, Pennsylvania.

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FREE Bulletin—$6000-$60,000; Unknown Self Working Family Security Plan. No equipment, Merchandise. Sound! No risk! Unlimited possibilities! Baugh-PS, 1514 "F" Street, Sacramento, California.

DOLLARS daily. Clip articles from newspapers. Free details. News Service, 3252 W. 84th, Cleveland 2, Ohio.

$600.00 A month plan free. Plan and copy of "Money Getters Bulletin" 25c. Globe-A, 40, Adelaide St. Sta., Toronto, Canada.

THOUSANDS of Moneymaking tips, home profit Plans! Free Folder! Synco, 1844 Drottinger, Wichita 18, Kansas.

WE pay cash for homework. No selling. Merco, Box 8032, Nashville 7, Tenn.

$35.00 WEEKLY addressing envelopes. Instructions $1.00 Refundable. Adservice, Spring Valley, New York.

FREE Book "505 Odd Successful Businesses." Work Home! Expect something Odd! Pacific-35c, Oceanside, Calif.

$1,000-$10,000 YEARLY Possible, operating home Mailorder Business! Free literature describes splendid money-making ideas, some using just pen—typewriter! Rush stamped, self-addressed envelope today! Zimmerman, 28-S, Schuele, Buffalo 15, New York.

60% PROFIT Cosmetics. $25 Day Up. Hire others. Samples, details. Studio Girl Hollywood, Glendale, California. Dept. 1169H.

PREPARE Income Tax Returns at home full or spare time. $5.00—$10.00 per hour. Practical Instructions amazingly simplified. No Lessons. Particulars free. Fox Business Publications, Box 1265-B, Peoria, Illinois.

IF you have a product or service that can be operated on a mail order basis, write me today. I will send you a Free Kit on "How To Make Money Out Of Classified Advertising." Next issue will be November. Closing date September 25. Hurry —Do it Today! O. K. Kelly, Classified Adv., Mgr., Dept. A9, 353 Fourth Avenue, New York 10, N. Y.

38A BUY IT WHOLESALE

WHOLESALE Catalog!! 30-80% Discounts! Appliances, Musical Instruments, Typewriters, Tools, Watches, Jewelry, Cameras, Housewares, etc. Consolidated Distributors, 1300-25 Main, Clifton, New Jersey.

ELECTRIC Guitars, amplifiers, wholesale. Free catalog. Carvin, PS287, Covina, California.

$12.95 KITCHEN Tool Set $5.95. Agents Wanted. Dicksie, Quitman, Arkansas.

BIG Multicolor Wholesale Catalog! Appliances, cameras, tools, watches, jewelry. Name brands. Huge discounts. Postcard: Selbyco, Decatur 172, Illinois.

BUY for your entire family at less than wholesale. Write for free club membership card entitling you to unbelievable bargain prices on all needs. Fotopak, Dept. PS956, Box 535, Rochester 2, New York.

39 FORMULAS, PLANS, ETC.

FORMULAS—All kinds. Latest products. Literature free. Kemico, Park Ridge 15, Ill.

LARGE formula catalog free. Anything analyzed $35.00. Western Chemical, Salem, Oregon.

SEND $1.00 for illustrated complete plans for game. Satisfaction guaranteed. Brownie's, 5835 Fairmount Avenue, San Diego 20, California.

MILLER'S Modern manufacturing formulas make fastest-selling products that get the business repeat! Fifty years supplying the best. Valuable Literature free! Miller, Chemist, 1517-C, Tampa, Florida.

40 PLASTICS

LEARN Plastics Fabrication For spare time income. Low cost home training now available. Write for free booklet. Interstate Training Service, Dept. D-2, Portland 13, Oregon.

PLEXIGLAS—Cut to size—Clear—Any thickness — Colors — Rods — Tubing. Mc. Clarin Plastics, P. O. Box 168B, Hanover, Pa.

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BOOK of experiments with plastics. Make your own tools and toys. Send $1.00 to Plastic Projects, Box 5151, Detroit 35, Michigan.

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POPULAR SCIENCE OPPORTUNITIES

PLEXIGLAS, Lucite, Square foot cost, 1/16"—$1.18; 1/8"—$1.52; 3/16"—$1.86; 1/4"—$2.21; 3/8"—$3.23; 1/2"—$4.36. Colors add 10%. Send 15% for postage. Aristocrat Plastics, 23-25 Sussex Ave., Newark, New Jersey.

NEW Liquid Casting Plastic, clear, colors. Embed real flowers, insects, photos, coins. Saw, drill, carve. Send 25c for handbook "How to Cast with Liquid Plastic" and proved success plan showing how to make money at home. Castolite, Dept. K-102, Woodstock, Illinois.

VACUUM Forming. Plastics Newest Field, Details 35c. Plastiform, Box 43, Elmhurst, Illinois.

41 CHEMISTRY & PHYSICS

EXPERIMENTERS: Terrific Bargains catalog—20c. Hagenow Laboratories, 2414 Clarks, Manitowoc, Wisconsin.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology 20c. Tracey Laboratories, Evanston, Illinois.

AMAZING New Book of Science. Experiments, Formulas and Catalogue of Laboratory Supplies. Only 25c. National Scientific Co., Dept. PS-9, 500 W. Road, Lombard, Illinois.

FREE! 5 Unusual Dazzling Experiments. Send 3c Stamp. Chemtron, Box 16, Ft. George Sta., New York 40, New York.

CHEMICALS and apparatus for industrial, analytical and private laboratories. Catalog 25c. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N.Y.

CHEMICALS, Supplies Catalog 25c, (refundable). Laboratory Sales, Box 161-F, Brighton, Mass.

EXPERIMENTER'S Newspaper—includes chemical experiments, news, projects—15c. Experimenter, 713 Second Street, Canonsburg, Pennsylvania.

BOOKLETS: 60 pages each! "Beginners Chemistry," "Chemistry," "Einstein's Relativity," "Physics," "Atomic Theory," "Electron Theory," "Scientific Oddities," "Light," "Sound," "Heat," "Electricity," "Radio," "Astronomy," "Useful Tables," "Geometry," "Mathematical Oddities," "Scientific Terms." (Order by Titles) 10c each. Frank's, 3121 South Racine, Chicago 8.

42 HELP WANTED

FOREIGN, Alaskan, USA, Job Opportunities!! To $1500 Monthly! Million Americans, Employed Overseas. Copyrighted Reports. Who to contact for highest paying jobs. Laborers — Trades — Truck Drivers—Office—Engineers, Many Others. 52 Countries—St. Lawrence Project, Spain, Latin America, Northern Projects, Europe. Year Registration—Advisory Service. Application forms. Unconditional Money-back Guarantee! $2.00 (Airmailed $2.25) (COD's Accepted). International Reporter, St. Louis 1-SK, Missouri.

FLORIDA jobs galore! Contacts, $2.00. Hayward Parker, 1737 Cortez Rd., E., Jacksonville, Florida.

FOREIGN and American Employment!!! High Pay. Overtime Work. Transportation expenses. World-wide Opportunities for skilled—unskilled. Most all Trades, Carpenters—Electricians—Truck Drivers—Mechanics. Many Others. Latest Guaranteed Reports, application form. How—When—Where to apply. Also Oil—Aviation—Steamship contacts. Guaranteed Satisfaction or Money Refunded. One-year registration — advisory service. Reports mailed same day order received!! Send $2.00 or C.O.D. plus postage. Act today and receive Bonus Report on St. Lawrence Seaway Project. Midwestern Services, Box 124, St. Louis 5, Missouri.

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FOREIGN Jobs—Latin America, Alaska, Canada, up to $1500 monthly. Up-to-date 1956 Foreign Service Directory gives complete information; hot list of firms hiring for Military and Civilian Construction, Aircraft, Oil, Exporters—Importers, Mining, $1.00. How-When-Where to apply. 9th successful year! Global Reports, Box 883-P, Hollywood 23, Calif.

CALIFORNIA Classifieds Airmailed. Six industrial Areas $5.00—any city $1.50. Newservice, 2700 Dana St., Berkeley, California.

COPYRIGHTED Reports on best paying jobs with travel, adventure, promotions. Construction, aviation, shipping, laborers, clerical, trades, supervisory, factory, unusual opportunities. Many types of work. Skilled and unskilled. Foreign and stateside openings for men and women. Only $2.00 ($2.25 airmail), including registration-advisory service. Satisfaction guaranteed. Included absolutely free: Special reports on Alaska, Spanish airbase construction, South American opportunities and husband-wife foreign jobs. Research Services, Suite 207-PSE, Brown Building, St. Louis 5, Missouri.

IF you have a product or service that can be operated on a mail order basis, write me today. I will send you a Free Kit on "How To Make Money Out Of Classified Advertising." Next issue will be November. Closing date September 25. Hurry—Do it Today! O. K. Kelly, Classified Adv., Mgr., Dept. A9, 353 Fourth Avenue, New York 10, N. Y.

43 AGENTS WANTED

HOW Much Extra Income Could You Use Right Now? $25 . . . $50 . . . $100 . . . or more? Hundreds of people everywhere turn spare time into hard cash, showing dazzling new assortments of Elmira Greeting Cards. Beautifully designed for every taste and occasion! Ideal as gifts or for personal use! Start now to make money this easy, pleasant, practical way! Send for your Free samples, catalog and brilliant assortments on approval, including personalized stationery, imprinted napkins, lovely wrappings and smart gift items. Elmira Greeting Card Co., Elmira, CN-158, New York.

EVERY man a prospect. Request free sales kit. Show line of belt buckles, individualized with prospect's personal name and emblems also transportation, police, fireman badges. Choice 3,000 emblems. Hook-Fast, Box 1425-PS, Providence, R. I.

YOUR own business—Suits $1.50; Overcoats 65c; Mackinaws 35c; Shoes 12½c; Ladies' Coats 30c; Dresses 15c. Enormous profits. Catalog Free. Nathan Portnoy Associates. 605-J West 12th Place, Chicago 7.

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GOLD or Silver letters, numbers. Windows, Doors, Trucks 1" to 6". 500% Profits—Free Samples. Atlas-U, 544 West 79th, Chicago 20.

NEW Jobs open in selling! Send name, address for five free issues of Opportunity Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 850 N. Dearborn, Dept. 18, Chicago, Illinois.

BUY Wholesale thousands nationally advertised products at big discounts. Free "Wholesale Plan." American Buyers', Hertel Station, Buffalo 16-L, N. Y.

GOLDMINE Of 600 money-makers. Copy Free. Specialty Salesman Magazine, Desk 6-B, 307 N. Michigan, Chicago 1.

FREE! Beautiful Feather Pictures 200% Profit! Apartado 9036, Mexico 1, D.F.

MEN—Women Agents; Sensational new moneymakers — Beautifully hand-painted, plastic personalized photo enlargements, compacts, rings, bracelets, lockets, etc. Simply take orders, pocket 40% commission—we deliver and collect. Sales outfit free. Novelco, 3343 North Avenue, Chicago 47.

SELL Precious Stones. No investment. Send deposit or credit references for approval selection. Beissinger, 417 Clark Bldg., Pittsburgh, Pennsylvania.

$1,000.00 A month for making dramatic 3-second demonstration of amazing lightweight Presto Fire Extinguisher. New chemical used by Airforce snuffs out fires instantly. Only $4.95. Terrific commissions. Millions want it. Free Kit. Merlite, 114 E. 32nd, Dept. P-53L, New York 16.

BIGGEST Christmas Card Profits. Sensational "Super-36" Assortment pays $1.25 profit on every box—$50.00 on 40 boxes easy. 200 fast sellers double earnings! Tall cards, Novelties, Stationery, Bargain Specials. Assortments on approval. Color catalog. Personalized Album Free. Midwest, 1113 Washington, Dept. 495-S, St. Louis 1, Missouri.

SELL Newest Tall Christmas Cards—make 75c on sensational $1.25 Assortment. 250 hottest Gifts, Cards, Stationery, 50 Exclusive Personalized designs, Super-Roll Gift Wraps, 30 for $1 Box. Samples on approval, surprise offers, prompt action Gift. Cardinal, 1400 State, Dept. K-80, Cincinnati 14.

AT Last! Something New and Sensational in latest Tall Christmas Cards. Make Extra Money Fast! Show Satins, Velours, Metallics. Gets Easy Orders. Pays up to 100% Profit. 30 Free Samples. With Name 50 for $1.50. Big Line. Amazing Convertible Pen-Pencil, Napkins, Gifts, Stationery. Several $1.00 Boxes on Approval. Puro Greetings, 2801 Locust, Dept. 641-L, St. Louis 12, Missouri.

AMAZING new "Touch-Glow" Christmas Cards sell swiftly from Free Samples. $62.50 profit on 50 boxes easy! Many Tall Cards, Stationery, Novelties, Album of Imprints. Profits to 100% plus Gift Bonuses. Samples on approval. Creative, 4401 Cermak, Dept. 510-D, Chicago 23.

GOOD Man Can make $3,000.00 next 90 days. Every house in town wants amazing NiLite "cats-eye" lawn sign. Automatic selling plan pays profits everyday. Write today for Free details. NiLite, 173 W. Madison, Dept. 302, Chicago.

IF you want to earn money fast, I'll send you Free Sample Stocking Of newest Stretch DuPont Nylons to sell at only $1 a pair. American Mills, Dept. 497, Indianapolis 7, Indiana.

ADD $20.00 to $200.00 Per Week To Your Income with Miracle Bowls! Sell door to door and store to store. "Just Add Water And Watch Them Grow." Write for free literature Now. Miracle Bowls, Dept. 4, Littleton, Colorado.

ANYONE can sell famous Hoover Uniforms for beauty shops, waitresses, nurses, doctors, others. All popular miracle fabrics —nylon, dacron, orlon. Exclusive styles, top quality. Big cash income now, real future. Equipment free. Hoover, Dept. J-101, New York 11, N. Y.

TREMENDOUS profits! Every man, woman and child a customer. Suits $1.50, Pants 35c, Dresses 20c, Shoes 20c. Operate from store, home, car. Free catalog. Superior, 1250-B Jefferson, Chicago 7.

WHOLESALE Catalog! 30-80% Discounts! Appliances, Musical Instruments, Typewriters, Tools, Watches, Jewelry, Cameras, Housewares, etc. Consolidated Distributors, 1300-16 Main, Clifton, New Jersey.

CHRISTMAS Cards—144 exceptionally distinctive greetings, all with customer's name. To attract big-volume sales, line includes many cards specially designed for business firms and professional people. All popular subjects, wide price range. Unequalled in lavish treatment, unusual illustration, high-quality stock. Up to $5 to $100 commission on each sale. Full or part time. Experience unnecessary. Old, established firm. For complete Sample Kit, write Process Corp., 1950 S. Troy, Dept. MR-9, Chicago 23, Illinois.

BIG Money-making opportunity. Exclusive line work uniforms. Jackets, pants, shirts, coveralls. Advertising embroidered. Every business prospect. Outfit Free. Master Co., 427 Water, Ligonier, Indiana.

POPULAR SCIENCE OPPORTUNITIES

FANTASTIC New money-making plan. Sell nothing, yet make to $50 daily! Offer women, personally or by mail (all materials supplied) beautiful, solid stainless steel tableware, complete with chest, free for selling just two sets to their friends! Exclusive patterns not sold in stores. Guaranteed 50 years. Truly successor to Sterling. Cannot rust, stain or tarnish. Banished "silver" polishing forever. Nothing to peel or wear off. Amazing low retail prices, yet you average over $30 profit on each transaction! Rush postcard for details, catalogue, other money-making plans etc. absolutely free. Topval Corp., Lindenhurst 20, New York.

MAN Wanted—Are you dissatisfied with your work? Would you like a business of your own? If so, write Rawleigh's, Dept. I-GG-PSC, Freeport, Illinois.

FREE box of 21 Nationally Famous Christmas Cards included with other fast selling assortments sent on approval. Earn $50.00 by selling only 50 boxes of our 900 Series Christmas Card Assortment. Can be done in a few hours of your spare time. Sunshine Art Studios, Inc., Dept. PS9, Springfield 1, Mass., Pasadena 1, Calif.

MAKE Up To 100% Profit In Your Spare Time! No experience needed! Sell from Big Free Catalog. Tremendous selection of unique gifts, gadgets, greeting cards, including world-famous brands like Westinghouse! Don't waste valuable time! Cash in on extra profits. Send for Free Colorful Catalog And Free Money Making Plan Today! Hurry! Greetings Unlimited, 399 Park Square, St. Paul, Minnesota.

SEEKING New Products? Get my outfit 47 money-making specialties. Latest conveniences for home, car. Send no money. Just your name. Kristee Company, Dept. 53, Akron 8, Ohio.

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SPARE time greeting card business! Show friends new type Tall, Parchment, Photochrome Christmas, All Occasion assortments. Make $50, $75, $100 extra money. Bonus. Write for Feature boxes on approval, 74 free samples Personal Christmas Cards, Stationery, free Catalog, Selling Guide. New England Art Publishers, North Abington 933-F, Mass.

MAKE 3 Days Pay In Day! Amazing Name-In-Silver Christmas Cards pay $65 on 65 boxes! No experience needed. Sample book Free, assortments on approval! "Southern Belle" Doll Free for promptness! Southern, 478 N. Hollywood, Dept. M-59, Memphis 12, Tennessee.

GET New Shirt Outfit Free: make $90.00 weekly on 5 average orders a day. Famous quality Made-To-Measure dress and sport shirts at $3.95 up sell fast to all men. No experience needed. Full or part time. Write: Packard Shirt Co., Dept. 308, Terre Haute, Indiana.

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BUSINESS Kit Free! Postcard puts you in business! Complete line. 190 shoe styles, also jackets. New discoveries pay Big Commissions. No investment. Send for Free Kit. Mason Shoe, C32, Chippewa Falls, Wisconsin.

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USED and new watches. $2 up. Free List. Southern Watches, Gray, Georgia.

DRYCLEANS Clothing for only 10c per garment. Lightning seller. Saves drycleaning bills. Samples sent on trial. Kristee Company, Dept. 54, Akron 8, Ohio.

NEW invention, $4.95 fire alarm, paying up to $1,100 a month. No wiring. Unlimited market. Dramatic demonstration. Free kit. Merlite (Alarm Div.), 114 East 32nd Street, Dept. F-53L, New York 16, New York.

FAST Selling Money Makers! Metallic Ironing Board Cover: Purse-Shopping Bag; many others including $1.00 retailers. Quality Products, (Dept. B), Box 748, Passaic, New Jersey.

SELL profitable personalized rugs. For information write Bobby's, Department 19, Manitou Springs, Colorado.

MASTICOTE "Alcoa Aluminum" Pigmented Liquid Roofing brings big orders. Our top salesmen average over $10,000 a year — commission. Madison Paint Co., Mfrs., Dept. PS569, Cleveland 2, Ohio.

NEED Money? $50 yours. Sell only 100 boxes new Christmas cards. Other amazing offers. Free samples imprinted cards. Feature box assortments on approval. Free catalog. 100 profitable items. Work with a national leader. Write today. Pen-N-Brush, Dept. PS-9, 139 Duane Street, New York City 13.

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EARN Extra Money. Sell Ladies Nylons. Star Line Distributors, 2945 So. 46, Milwaukee 19.

EASY handwork makes fast-selling articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

BUY wholesale women's—men's hosiery, neckties. Biasi. Dept. P96, 386 Fourth Avenue, Newark, New Jersey.

FREE book "505 Odd, Successful Businesses." Work home! Pacific-38C, Oceanside, Calif.

BIG Profits! Sell amazing Seal-Tite puncture-proofing Compound to car owners, cab and truck fleets, service stations, etc. Terrific appeal, fast $1.98 seller! Free details. M&M, Dept. 2-PS, 842 Third Avenue, New York 22.

RUN Spare-Time Greeting Card and Gift Shop at home. Show friends samples of our new 1956 Christmas and All-Occasion Greeting Cards and Gifts. Take their orders and earn to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 90, Ferndale, Michigan.

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MAKE $10.00 An Hour or more, spare time, with tested Free Trial Sales Plan for fastest-selling new home appliance. Defrosts refrigerators automatically. Sell 8 homes in 10. Free details, guaranteed profit offer. Write Defrostomatic, 173 W. Madison, Dept. D-103, Chicago.

$1.00 PROFIT selling $2.95 photo enlargement offer. Allen Studio, Reigler Bldg., Little Rock, Arkansas.

$3.00 HOURLY Possible; Catalogue, Literature, Samples $2.10. (Refundable.) R. Plumb, Herkimer, New York.

60% PROFIT Cosmetics. $25 Day Up. Hire others. Samples, details. Studio Girl Hollywood, Glendale, California. Dept. 1169H.

SELL Negro Christmas Cards, exclusive, new styles, full discounts, big profits! Send $1 for sample kit, applied against first order or refund guaranteed if not satisfied. Color-Tone Originals, 110 Pearl Street, Mount Vernon, New York.

BALL Point Pen uses ordinary ink. Guaranteed. Details free. Sample $1.85 ppd. Orchard, Box 151, Skokie, Illinois.

IF you have a product or service that can be operated on a mail order basis, write me today. I will send you a Free Kit on "How To Make Money Out Of Classified Advertising." Next issue will be November. Closing date September 25. Hurry—Do it Today! O. K. Kelly, Classified Adv., Mgr., Dept. A9, 353 Fourth Avenue, New York 10, N. Y.

44 HIGH-GRADE SALESMEN

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$1,000.00 A month for making dramatic 3-second demonstration of amazing lightweight Presto Fire Extinguisher. New chemical used by Airforce snuffs out fires instantly. Only $4.95. Terrific commissions. Millions want it. Free Kit. Merlite, 114 E. 32nd, Dept. P-53L, New York 16.

ADVERTISING book matches—Cash in on big demand—sell Union label matches. Cuts for all businesses and political parties—Free powerhouse selling kit—low prices—protection guaranteed on repeat orders—Cash commissions. Superior Match Co., Dept. P-956, 7530 Greenwood, Chicago.

USED and new watches. $2 up. Free List. Southern Watches, Gray, Georgia.

NEW invention, $4.95 fire alarm, paying up to $1,100 a month. No wiring. Unlimited market. Dramatic demonstration. Free kit. Merlite (Alarm Div.), 114 East 32nd Street, Dept. F-53L, New York 16, New York.

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EARN While You Learn Auto And Diesel Mechanics. Master this top paying trade. Many graduates earn $100 a week and up. Approved for Korean veterans. For free information write Dept. No. 262, Nashville Auto-Diesel College, Nashville 3, Tenn.

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ENGINEERING Degrees earned by home study. American College of Engineering (University of the West), Box 27724 (A), Hollywood 27, Calif.

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HELP yourself to abundant living. Our courses have aided students to richer, fuller lives. Learn secret of contentment, happiness. Earn degrees Ps.D. Ms.D. Write for free book. College of Universal Truth (Correspondence School), 23-K E. Jackson, Chicago.

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U.S. Civil Service Tests! Training until appointed. Men — Women, 18-55. Start high as $87.00 week. Experience often unnecessary. Get Free 36-page book showing jobs, salaries, requirements, sample tests, benefits. Write: Franklin Institute, Dept. Y-22, Rochester, New York.

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EDUCATIONAL books, correspondence courses, bought, sold, rented. Free Catalog. Willard Bayles, 211 Essex, Hackensack, New Jersey.

46 CONTESTS

WIN contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609-A East 5th, Duluth, Minnesota.

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47 DETECTIVES

DETECTIVE Training. Phillips Secret Service System, 1917-C North Kenneth, Chicago 39, Ill.

DETECTIVES—Work home—Travel. Experience unnecessary. Detective Particulars free. Write Wagoner, P-125 West 86th, New York 24.

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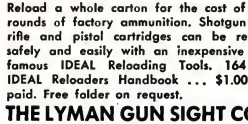

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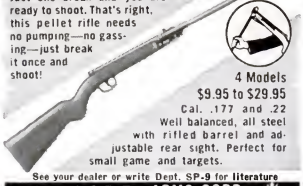

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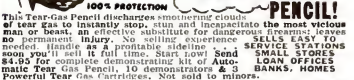

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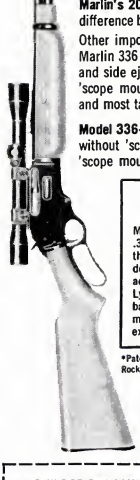

Micro-Groove Rifling has **16** lands and grooves, much finer than the ordinary, and specially shaped. Instead of squeezing wide, deep channels into the bullet jacket, they grip lightly. The projectile remains smoother, more perfectly shaped and balanced, and is truer in flight and less affected by winds.

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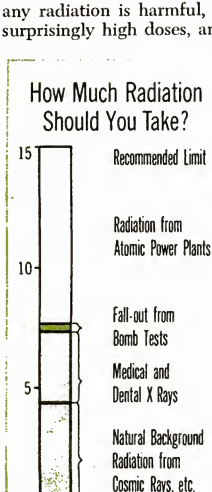
POPULAR SCIENCE MONTHLY

LATE NEWS...

Danger . . . radiation—not just in atomic laboratories but everywhere. That was the somber warning from the experts who studied the genetic effects of atomic radiation for the National Academy of Sciences. They agreed that any radiation is harmful, that we are already receiving surprisingly high doses, and that increased doses, which are inevitable, should be kept as low as possible.



The greatest danger is to future generations. Radiation permanently changes the heredity cells that shape a person's children and his children's children and so on. The more radiation, the greater is the number of heredity changes. The changes nearly always cause harm, but it may be of any degree and any kind: slightly weaker babies, less intelligent babies or no babies at all.

Most of the radiation we now get is unavoidable. It comes from natural sources—cosmic rays and radioactive rock—to which people have been exposed since the human race evolved. But medical and dental X rays add, on the average, nearly as much more (see chart). Fall-out from bomb tests contributes comparatively little.

The report recommended a limit, averaged over the entire population, of a total of about 15 roentgens of radiation every 30 years. (Most people have their babies before they reach 30). The maximum, applying to individual persons such as atom workers, would be about 55 roentgens. Both of these limits are calculated risks; if the average limit is reached for one generation, it will probably cause the following generation to bear 50,000 babies that are defective in some way.

Musical furnaces may be coming. A University of Cincinnati engineer reports that air is heated more efficiently in a furnace if it is vibrated by sound waves coming from a musical reed.

Happy pills are making psychiatrists unhappy. They warn that the pills, which simply make people stop worrying, should be used only by those actually under medical care. Right now everybody from truck drivers to TV stars is gobbling them—35,000,000 prescriptions for these drugs alone are expected to be filled during this year.

Aluminum cans will replace tin ones in the pantry within three years, predicts Dr. Nelson Murphy of Virginia Technical Institute. He has discovered a new way to plate steel with aluminum, which is fairly plentiful in the U.S. All tin, which is a vital military material, must be imported.

Good books. Workshoppers will find solid information in two new paperbacks by PSM contributors. *How-to-Do-It Pictures* by Darrell Huff and Paul Corey (Eastman Kodak Co., Rochester, N.Y., 50c) explains how to make how-to-make-it photos. *Hobby Tools* by Robert Gorman, with illustrations by Henry B. Comstock (X-ACTO, Inc., Long Island City, N.Y., 75c), goes into detail on the technique of using handicraft tools.

80 TIMES AROUND THE WORLD— AND NOT A SINGLE BATTERY FAILURE!

Test Proves Auto-Lite Sta-ful Finest Battery Money Can Buy

A dramatic test of battery endurance, conducted by Auto-Lite battery engineers, has proved to motorists that battery worries can be avoided!

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*In normal car use

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Prize Projects BY PS READERS

He Makes Tiny Tools. The hobby of Edward H. Moore of Orrington, Me., is constructing miniature tools, mainly by filing them out of bits of brass. As many as 11 separate parts were used in a carpenter's plane and 10 in a hand drill. Tool handles and the chest are mahogany.

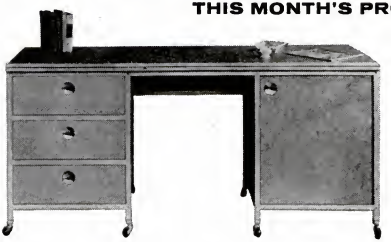
Tractor Has Two Gearboxes. A Model T front axle, shortened and inverted, carries the front wheels on this riding tractor. An eight-hp. air-cooled engine drives two Chevvy transmissions in series. Vincent Johnson built it to cultivate a garden on his Kennedy, Minn., farm.

Famous Stage Is Modeled. Jack Clennin of McCloud, Calif., made this model of a Wells Fargo stagecoach that Buffalo Bill once drove. Working from plans published by PSM 19 years ago, Clennin kept the detail so exact that even the tiny harness buckles can be undone. The horses are carved from sugar pine.

Have *you* recently completed a shop project of which you are particularly proud? Send a good picture of your finished work, along with the negative and a brief description, to POPULAR SCIENCE MONTHLY's Mechanics and Handicraft Editor, 353 Fourth Ave., New York 10, N. Y. We will pay $15 for each item that is accepted for publication.

IDEAS FROM WELDWOOD

THIS MONTH'S PROJECT—DESK-SEWING TABLE



Here is one of the most versatile, easy-to-build pieces of furniture you can have in your home. First, it's a desk—durable and steady for tots' or teens' homework. Then, it's a sewing table too—with a hinged top that swings out to form a generous 4′ x 6′ work area for cutting out patterns. (When not used for sewing, it can be wheeled back against the wall.) And the drawers and doors make it a spacious storage cabinet. For Easi-Bild* Plan, see coupon.

Constructing this desk-sewing table is really easy. For it is made of Novoply® panels framed with angle irons. Novoply is Weldwood's 3-ply all wood panel made of resin-impregnated wood chips and flakes fused under tremendous heat and pressure. Because of this exacting construction, Novoply panels are extremely stable and virtually warp-free! You'll find Novoply easy to work—resists splitting from nails or screws.

Novoply has a textured, mosaic-like appearance that's handsome and distinctive. So you can either finish it natural—paint it—or cover it with durable Micarta® for scuff-proof, scratch-resistant service. Send for plans today, and see if your kids don't *almost* enjoy doing homework this year.

*T.M. Reg. Easi-Bild Pattern Co.

This Month's Hints

Installing curtain or drapery rods?

You can avoid drilling into plaster or masonry by following this method. First, make sure your plaster is perfectly sound. Next, take two pieces of plywood—about 2″ square and ¾″ thick—drill or nail curtain rod braces and holders to the pieces of plywood. Coat one side of each with Weldwood Contact Cement. Next apply Contact Cement to wall at top corners of the window. Press the blocks to the cemented wall areas and they will be in place permanently. E. W.—Arlington, Virginia.

$10 for your ideas

for "This Month's Hints," if accepted for publication. (Hints must apply to same Weldwood product.) Send them to Weldwood Hint Editor, 55 West 44th Street, New York 36, N. Y.

HAVE A QUESTION? Send it to "The Weldwood Question Box," 55 West 44th St., New York 36, N. Y.

THE WELDWOOD QUESTION BOX

Q. I've got an old, scratched, and banged upright piano that still has a good tone. Is there any easy way to refinish it or "dress it up" so it will look as good as it sounds?

A. Of course you could scrape the finish off down to the bare wood, but that takes a lot of elbow grease. Why not try this: bond ¼″ thick Weldwood hardwood plywood to the exposed parts of the piano with Contact Cement (one quart should do the job). With the big 4′ x 8′ panels you can cover the piano quickly and handsomely. You can choose from a great variety of woods, too. Birch, for example, will give a nice modern appearance, while mahogany will blend in well with traditional furnishings. Remove ornamentation such as carved moldings, and roughen the polished surfaces with sandpaper to assure good bonding. Take the piano case apart and cover each part separately to make the job easier.

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Everyone has his own pet idea of a gadget that he would like to see in general use. These five ideas were suggested by POPULAR SCIENCE readers. What is *yours?* We will pay $5 for each one published. Please use Government postcards only. Write your name and address clearly. Contributions cannot be acknowledged or returned.

I'd like to see them make...

PAINT PENCILS, like crayons, to match every shade of paint shown on the season's color wheel. They'd make touch-up jobs on your automobile a cinch.—*M. M. Carey, New Castle, Pa.*

A REMOVABLE COWL on car dashboards so that repairs to the wiper motor, radio and other equipment behind the dash could be made easily from above.—*Floyd L. Ketel, Portland, Ore.*

A WEIGHTED STEEL TAPE with a dial register in the heavy housing. One person could run the tape across a room and return to the dial for a reading.—*P. Feller, North Arlington, N. J.*

A SHOESHINE BOX with clamps on each side to hold the shoe steady while you polish it. Adjustable clamps like those used on roller skates would do the trick.—*Andy Lea, Seattle, Wash.*

THIN ONE-SIDED PHONOGRAPH DISKS with contact adhesive on the backs. Then you could buy two different platters you want and stick 'em together.—*Bill Wintrich Jr., Columbus, Ohio.*

Once a dreary attic . . . now a cheerful room!

With a few household tools and Gold Bond Insulation Planks and Tiles, *you* can build a room just as attractive as this in your attic or basement.

Walls of Gold Bond Insulation Planks go up fast. The Planks are lightweight, easy to handle. Arrange them vertically, horizontally or diagonally over furring strips and nail or staple. Interlocking edges hide the fasteners. The Planks come with a flame-resistant finish of ivory or a random assortment of four harmonizing colors . . . take paint perfectly, too. They are sound-absorbent for restful quiet. And they insulate the room, keep you cooler in summer, cut fuel bills in winter.

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It's the little things . . .
the details that you can add
yourself . . . that will
Make Your Home a

Show Place

OPERATION HOME IMPROVEMENT
56 the year to fix

Even a modest home today may qualify as the show place of its neighborhood, a home that will draw admiring glances from passers-by and cause guests to ask for a tour of inspection.

A show place is the sum of many distinctive little things, each blended into a pleasing whole. Happily, these details are nearly always projects that a homeowner can logically undertake with his own hands.

You'll find a selection of show-place ideas on the following pages, all built with materials available from *your* lumber-building materials dealer.

It's unlikely that you will want to build them all. But whatever your needs and your future plans, you'll find some that you can fit into your own particular scheme of making *your* home a show place.

Show Place

Stairway

is equally at home in living

PLANNING a basement game room or new home? Then consider the merits of an unusual but practical stairway in the home of the Ray Piochs:

- Its open construction makes a room look bigger.
- It is modern in concept, an asset to contemporary furnishings.
- It is easier to build than the conventional stairway.

Planning a game room for their Long Island home, the Piochs ran into a troublesome problem with the old stairway.

How could they decorate, or camouflage, those old rough steps to blend into their proposed show-place game room?

Ray Pioch is a man with vision and ideas—and incidentally the artist who paints for POPULAR SCIENCE MONTHLY such striking illustrations as the proposed city in space in last May's issue.

His old stairway descended midway in the rectangular basement—parallel to the ends of the house. A wall could go beside it, with the game room and stairway occupying one end of the basement, the

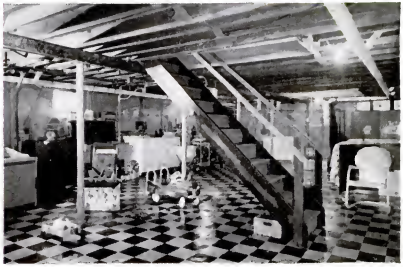
[Text continued on page 244]

IN A LIVING ROOM, stairway might look like this one, sketched by Harry Marinsky, illustrator and color stylist who styled the game room shown above and on the cover. Furniture in the cover photo is made by Arbuck, Inc., New York.

 For how-to-build-it pictures, turn to pages 102-103

CHILDREN'S LUNCH BAR occupies the corner behind this handsome game-room stairway in the Long Island home of Mr. and Mrs. Ray Pioch. The bar, which is 48" long, is fastened to the stair-supporting posts.

NEW STAIRWAY at left was installed in place of old set of steps shown below. A paneled wall at far side of stairway now separates game room from utility room. A door at foot of stairs connects the two.



PSM PHOTOS BY W. W. MORRIS

for Moderns

room or basement game room. And it's easy to build.

Major steps in building the new stairs

1 PARTITION FRAMING will support one side of new stairway. At this end, treads will rest on horizontal stretchers nailed in pairs between studs. The old stairs are still in place here.

2 THREE-BY-THREE POSTS at the open side are anchored to the concrete floor with steel pins. Here, the posts are being plumbed and then nailed temporarily to the joist overhead.

5 OLD STAIRWAY finally comes out—but not until all structural parts of the new one are cut. This prevents any inconvenience while work is in progress in a one-entry basement.

6 TREADS ARE LOCKED between the posts as their notches are slipped into place. This assembly requires installing one post, then a tread, then another post, and so on down the line.

3 NOTCHES ARE CUT in the front and back edges of the two-by-twelve treads to mate with corresponding notches in the posts. These are chiseled out after the saw cuts are made.

4 POSTS ARE MARKED for notching by resting one end of a long level on the tread-supporting stretchers in the wall framing. The best rule here: Measure twice before cutting.

7 PINE-PANELING joints align with vertical centerlines of three-by-three posts. Paneling is cut and butted against tread, above and below. A single notch is needed in each piece.

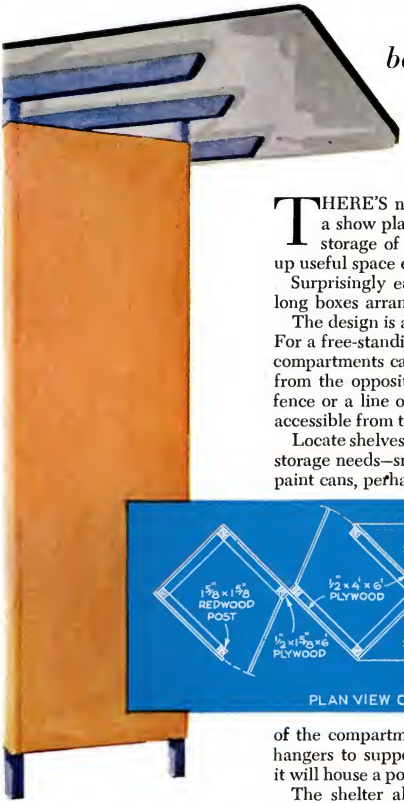
8 TRIAL RUN up and down the stairway is now in order. Finishing touches include toenailing treads to posts and gluing wood strips to free ends of the treads to combat warping.

Show : *Place*

Garden Shelter

- *Use plywood to build it*
- *Has four storage stalls*
- *Has shelves outside*
- *Vary the plan to suit your needs*

gives you a place to store everything that now clutters basement or garage.

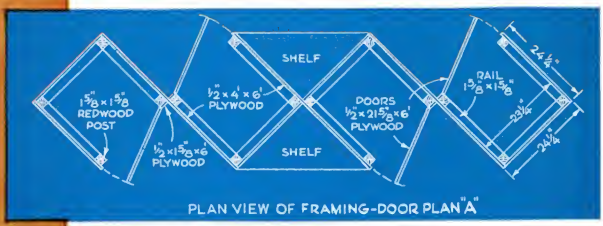


THERE'S no better way to start making your home a show place than by building a shelter like this for storage of all the odds and ends that so often take up useful space elsewhere.

Surprisingly easy to build, the shelter consists of four long boxes arranged on end—with corners touching.

The design is adaptable for different uses and locations. For a free-standing structure in an open area, two storage compartments can be made accessible from one side, two from the opposite. If the shelter is to back up against a fence or a line of shrubs, all compartments can be made accessible from the outer side.

Locate shelves inside the compartments to suit your own storage needs—small garden tools and supplies, half-filled paint cans, perhaps the garbage can. Or keep one or more



PLAN VIEW OF FRAMING-DOOR PLAN "A"

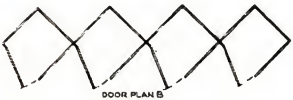
of the compartments free of shelves and install hooks or hangers to support long-handled tools. A lean-to behind it will house a power mower and wheelbarrow.

The shelter also lends itself to useful storage on triangular exterior shelves, the amount depending on the door plan that you choose. When all doors are on one side, all bays on the opposite side can be used for triangular shelves.

Designed for the Douglas Fir Plywood Association by

Anshen & Allen, San Francisco architects, the main shelter makes use of three 4′-by-6′ panels of ½″ exterior plywood without cutting—just as you buy them.

You'll see on the basic plan on the preceding page that each of these three panels serves as a continuous wall for two



adjoining compartments, locking the structure together. In all except door plan C, the three panels are arranged parallel to each other. In the latter, one panel, is placed at right angles to the other two to get the door arrangement shown. In this case the width of one panel must be reduced by sawing off a ½″ strip.

From the remaining five 4′-by-6′ panels of ½″ plywood in the list of materials, cut two pieces 24¼″ wide and 6′ long (for the extreme end walls) and eight pieces 23¾″ wide. Then saw strips 1⅝″ wide lengthwise from one edge of each of four of the 23¾″ panels. Use these strips to face the two-by-two posts (1⅝″ by 1⅝″ actual dimension) to which the doors are hinged. The remaining panels 21⅝″ wide serve as doors.

It's advisable to select redwood or other rot-resistant wood for the two-by-two corner posts. If the shelter is placed on gravel or an area of bare ground, set a minimum of four two-by-four posts below frost level. Cut these off about four inches above the ground and bolt the bases of corresponding corner posts to secure the shelter from being toppled by the wind.

If you prefer to locate the shelter on a concrete slab, embed anchor bolts head down in the soft concrete, positioning

[*Continued on page 250*]

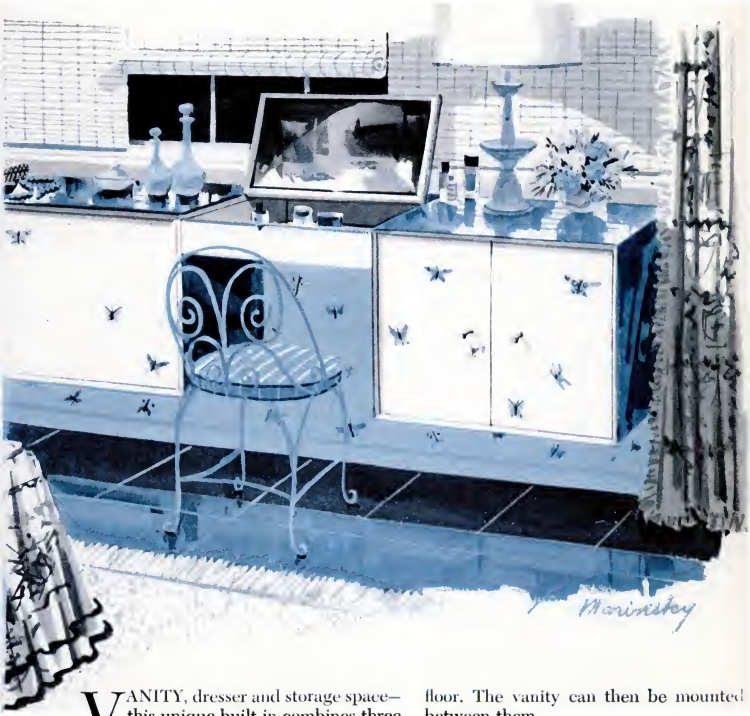
Show : *Place*

Vanity

THERE'S A WEALTH of handy storage space just behind that big, pull-down door.

Dresser

for the young lady of the house.



VANITY, dresser and storage space—this unique built-in combines three essential facilities of a teen-age girl's room. Add a chair or stool and it's a safe bet that any young miss will bring in her friends to praise your handiwork.

The end cabinets should be fully assembled before being attached to the wall with the bottom edges 10″ from the floor. The vanity can then be mounted between them.

Use ¾″ hardwood-veneer plywood for the outer parts, ½″ fir plywood for shelves and cabinet back, ¼″ for dividers.

Build the cabinets with butt or rabbet joints at the corners, and rabbet the back edges to recess the backing panels. Make

[Continued on page 252]

Show Place

Entry Divider

helps welcome your guests.

DEEPLY grooved plywood gives a ready-made custom touch to this entry divider, designed for the home that lacks an entrance hall. Grooved plywood is used in making the bench, doors and back.

Build the cabinet first, ripping the sides from 48" width of ¾" plywood. Cut the top the same width as the sides but make the bottom ⅝" narrower. Cut a rabbet ⅜" wide and ⅝" deep in the back edges of the top and sides.

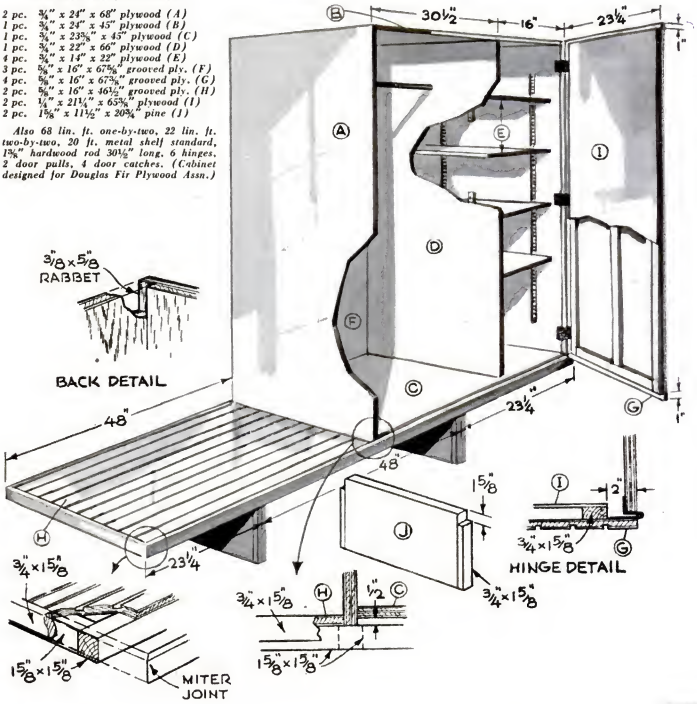
Assemble these parts and the divider (D) with glue and nails. Position the bottom (C) ½" up from the lower edges of the sides and flush with the front as seen in the detail sketch.

Three 16"-wide strips of grooved

THE MATERIALS YOU NEED

2 pc. ¾" x 24" x 68" plywood (A)
1 pc. ¾" x 24" x 45" plywood (B)
1 pc. ¾" x 23⅝" x 45" plywood (C)
1 pc. ¾" x 22" x 66" plywood (D)
4 pc. ¾" x 14" x 22" plywood (E)
3 pc. ⅝" x 16" x 67⅝" grooved ply. (F)
4 pc. ⅝" x 16" x 67⅝" grooved ply. (G)
2 pc. ⅝" x 16" x 46½" grooved ply. (H)
2 pc. ¼" x 21¼" x 65⅝" plywood (I)
2 pc. 1⅝" x 11½" x 26¾" pine (J)

Also 68 lin. ft. one-by-two, 22 lin. ft. two-by-two, 20 ft. metal shelf standard, 1⅝" hardwood rod 30½" long, 6 hinges, 2 door pulls, 4 door catches. (Cabinet designed for Douglas Fir Plywood Assn.)



plywood (Texture One-Eleven) with grooves 2″ apart are needed for the cabinet back, the material being mounted with the grooves running vertically.

Cut all three strips to a 67⅝″ length. Place these flat on the floor with the shiplap edges together to determine the total panel width needed. Remove the lap from the outer edge of one outer strip and rip enough off the other strip so that the panel fits within back-edge rabbets.

Use two 67⅝″ strips of the grooved plywood to make each door, cutting equal amounts off each outer edge to give a total width of 23¾″. This places the shiplap joint over the centered vertical member of the ¾″-by-1⅝″ door framing. Space this frame 1″ from the top and bottom of the door, 2″ from the hinging edge and flush with the other. Cover the frame inside with ¼″ plywood. Mount each door with three offset hinges.

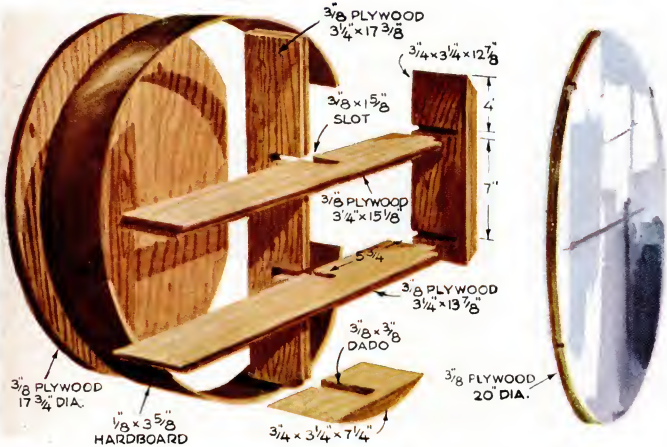
The bench frame consists of two 93″ lengths of two-by-two (1⅝″ by 1⅝″) with spacers between to make a frame 24″

[Continued on page 264]

Show Place

Bathroom Cabinet

is a handsome and useful circle on the wall.



HARDBOARD bends easily to form the curved outer wall of this unusual cabinet. The cabinet can be built so that the plywood door with the round mirror cemented to it opens at either side.

Notch the main shelves and the vertical divider for interlocking joints. At one end, these shelves slip into blind dadoes in the ¾″-thick hinge strip. The bottom of the divider also goes into a dado, in the bottom shelf. Shape the lower edge of this shelf to the same arc as the cabinet back—a 17¾″ disk of ⅜″ plywood with a slice taken off one side to match the hinge strip. Glue and nail all parts together. Then cut or sand the ends of the hinge strip and the free ends of the main shelves and divider to match the back.

A 50″ strip of ⅛″ hardboard, 3⅝″ wide, for the outer wall, is soaked in water for about an hour. With the smooth side out, nail one end to a beveled end of the hinge strip and bend the hardboard gradually around the back disk, nailing as you go. Cut off the excess.

Clip or contact-cement a 20″-diameter, full-circle mirror to the door.

Show Place

Bathroom Rack

holds a supply of towels . . . serves as a divider, too.

EVEN in the smallest bathroom, you can usually find room for this handy modern rack for towels and accessories. It occupies what otherwise would be open space between the floor and ceiling.

Build it of one-by-six wood and 1″ dowels, suiting the width to the width of the tub. One-by-sixes give a convenient shelf depth for storing extra towels and toiletries without occupying too much floor space at the end of the tub.

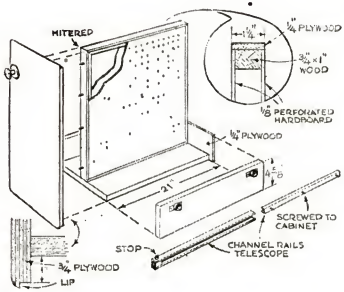
After cutting the two uprights to fit snugly between floor and ceiling, clamp one flat on top of the other and mark positions for the towel-rod holes. Locate three or more rods directly above each other as shown. Or stagger them, some to the right and some to the left, to give the rack a greater capacity by permitting towels to overlap.

With the two uprights still firmly clamped together, drill 1″ towel-rod holes through the top board and partly through the one underneath. Use the latter board, with the blind holes facing in, as the outer upright. This locks the rods between the uprights, gives a smooth outer surface.

How you can add a Show Place

Pan Rack

to your present kitchen.



THE beauty of this useful built-in is that you can add it to an existing cabinet, building it to fit the available space. The rack pulls out easily on ball-bearing rollers riding on telescoping rails. Cut the ¾" plywood door to suit the opening. Make the height of the perforated-hardboard rack 2" less than the door height. A 21" front-to-back depth will suit most cabinets. Boards on either side form a shallow bin for loose lids.

Show Place

Card Table Compartment

and plate rack is a distinctive built-in for any room

KITCHEN, dining room, living room, game room—place this simple built-in where you wish. It always will be a handsome addition to your home. Two standard card tables can be stored in the base, prize plates and knickknacks on the shelves.

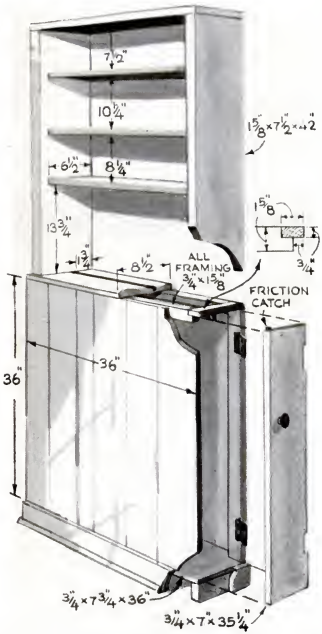
For a built-in look, surround the cabinet with a baseboard the same width as the one in the rest of the room. Remove the existing baseboard if possible. Otherwise, use filler strips behind the cabinet.

Block up the ¾″-by-7¾″-by-36″ cabinet floor so that its upper surface is even with the top of the baseboard. Notch the back corners of the floorboard for ¾″-by-

1⅝″-by-36″ frame uprights, one of which holds the door hinges.

Nail the floor blocking to the room floor and the cabinet floor to the blocking. Cut and fit the paneling pieces but do not put all of them into place until the upper shelf unit has been assembled and attached to the base by screws run up through the frame.

Use two-by-eights (1⅝″ by 7½″ actual) for the uprights, one-by-nines for the



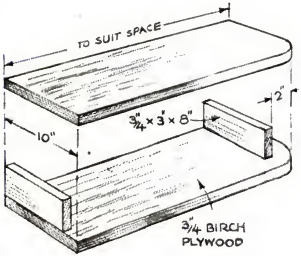
bottom shelf and the top, one-by-sevens for the intermediate shelves. Rout a ¼″-by-¼″ groove 1⅝″ from the back edge of each shelf to hold plates, or tack on strips of ¼″ quarter-round if you prefer.

Secure the unit to the wall by angling screws up through the back edge of an upper shelf into the studs.

One of these Show Place

For a corner

Position two spacer blocks between two 10″-wide strips of ¾″ birch plywood and nail the shelves to them—or assemble with glue. Apply matching wood-veneer tape to the exposed edges. Using angle irons, mount the unit at comfortable sitting height.

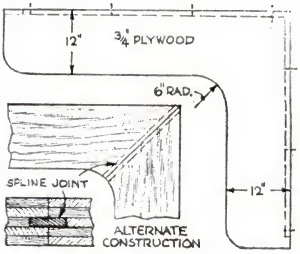


Phone Built-ins

will look just right in your home.

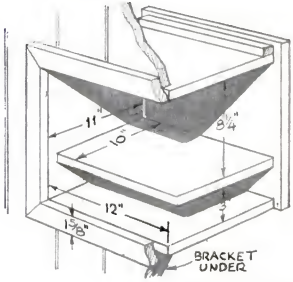
For a kitchen

SAW an L-shaped shelf from a panel of ¾″ plywood and bracket it into a corner. This is particularly good where you want to avoid obstructing a passageway. To do the job with less waste of wood, make the shelf of two pieces, splining them at the corner.



For a hallway

INSERT this traditional box niche into a hole cut through the wall under a stairway or into a closet. Build the box of ¾″ plywood or one-inch stock. Support it with brackets placed underneath. Frame it around the outside with mitered strips of one-by-twos.



Two modern glamor materials are combined in this

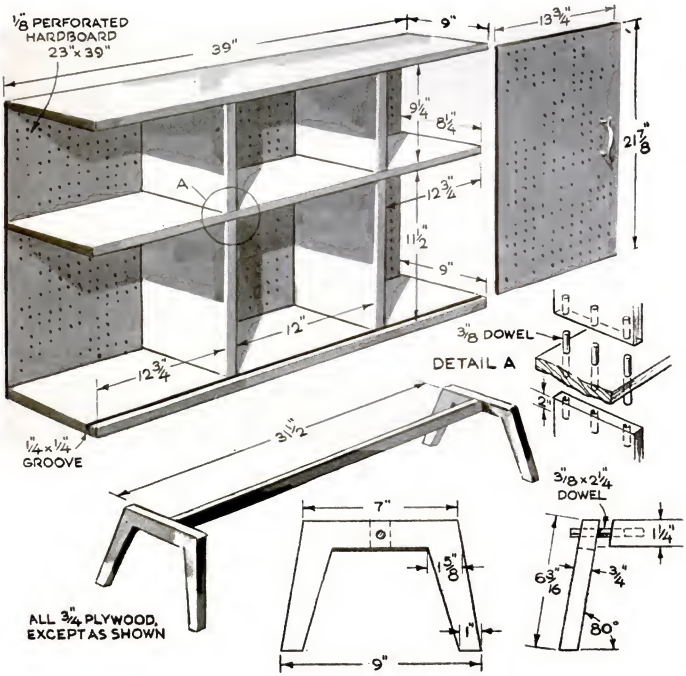
Show Place

Bookcase

PERFORATED hardboard painted a bright color complements the sun-flecked beauty of natural-finish birch plywood in this handsome bookcase.

The list of materials shows how to cut the pieces. A 3′-by-4′ panel will yield all of the plywood parts. You'll need a 4′-by-4′ panel of ⅛″ perforated hardboard.

A ¼″-by-¼″ groove must be cut in the top and bottom shelves for the sliding door. All of the plywood parts are joined with blind dowels, and the holes for these must be drilled carefully. Use 12 of the short dowels to join the dividers to the top and bottom shelves, two for the leg assembly. Use the long dowels to secure the middle shelf (Detail A).



MATERIALS YOU WILL NEED

2 pc.	9" x 39"	¾" birch plywood	(shelves)
1 pc.	8½" x 39"	" " "	(shelf)
2 pc.	8¼" x 11½"	" " "	(divider)
2 pc.	8¼" x 9¼"	" " "	(divider)
2 pc.	6½" x 9"	" " "	(legs)
1 pc.	1¼" x 32"	" " "	(leg stretcher)
1 pc.	23" x 39"	¼" perf. hardboard	(back)
1 pc.	13⅜" x 21⅞"	" " "	(door)
6	4½" long	⅜" dowels	(to secure middle shelf)
14	2¼" long	" "	(to secure outer shelves)
	1¼" wood screws	(to attach leg assembly)	

Cut the legs from the two 6½"-by-9" pieces of plywood, shaping them as the drawing shows. Bevel the ends of the 1¼"-by-32" leg stretcher to 80 degrees so that the legs will cant outward. Bevel the top edges of the legs and the bottoms of the feet to match. If you would rather avoid the careful fitting required here, use ready-made wood or metal legs.

Sand exposed edges of the plywood lightly, taking care not to round the corners. Apply ¾" veneer tape to these edges to hide the plies. You'll need 20′ of tape.

Assemble the shelves and dividers with glue and dowels. After tightening the clamps, check all of the joints to be sure they are square. Attach the leg assembly with glue and 1¼" wood screws, running the screws into the bottom shelf from underneath. Counterbore the screw holes in the leg assembly ½" and recess the screw heads.

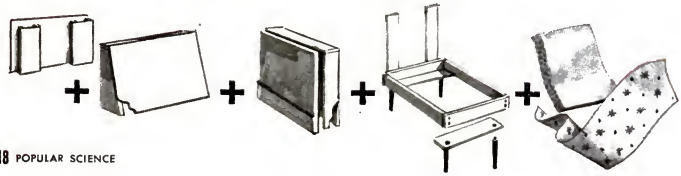
Apply clear penetrating sealer to the birch, allow to dry thoroughly and smooth with fine steel wool. Apply another coat, wait about 10 minutes and then polish with a cloth damp with turpentine. Paste wax well rubbed gives a deep luster finish of surprising durability.

After painting the hardboard, attach the back with ⅝" wood screws. Then screw a bronze handle to the door and the job's done.

Show Place

Furniture

for young moderns on a budget. Here's how to build it.



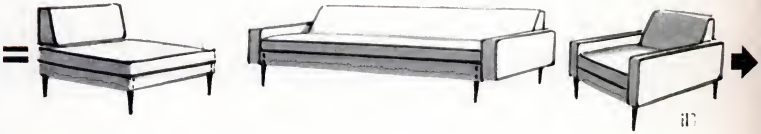
SIT down in that easy chair. Stretch out on the armless sofa. Stroll over and try the sectional couch or the love seat adjoining the corner table.

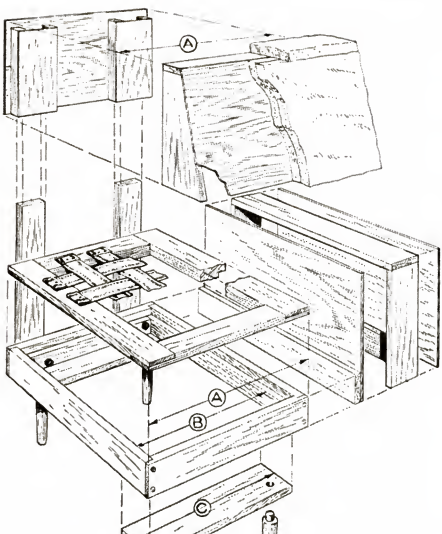
They are all comfortable.

They should be. They're generously designed for room and for angles as pleasing to the body as to the eye. And they're well padded with foam rubber.

As you can see, there's a lot of family resemblance among the pieces. That's because, structurally, they are alike except for length and the presence or absence of arms.

Three lengths—21″, 36″ and 72″—and the option of two, one or no arms make





ONE BASIC PLAN enables you to build all the furniture you see on the preceding two pages. Front-to-back and vertical dimensions are the same in all cases. Just vary dimensions represented by A, B and C on the drawing.

Chair—A, 21"; B, 17⅜"; C, 18⅞".

Sofa—A, 72"; B, 68⅜"; C, 28⅞".

Love seat or sectional couch—A, 36"; B, 32⅜"; C, 28⅞".

For all pieces except the chair, leg assemblies are placed from front to back across ends instead of crosswise, as shown for the chair.

Webbing is crisscrossed on seat frame to support cushions, and back and arms are padded with 1" or more of foam rubber under the fabric.

Backs are supported by plywood sleeves that slip down over hardwood uprights bolted to the base—and can be lifted off to lighten the load when you move the furniture.

Arms are easily removed, too, in case a room plan calls for an armless or one-armed chair, or love seat.

this a remarkably versatile line of living-room furniture. For instance, you can build the sofa with arms or without. And you can slip off the back—it just lifts up—to make a guest bed.

Build two of the middle-length units and put them together (using one arm on each) for a sectional couch. Or build one and put on two arms—and you have a love seat.

For a three-piece sectional couch, build three chairs, but leave one without arms, put one arm on each of the others. Or build an armless chair and use it between two of the middle-length units.

Construction. The frames are a simple construction of easily worked materials—¾" fir plywood, 1" (actually ¾") softwood such as pine, and hardwood 1 1/16" thick.

For strength, use hardwood to make the outer seat frames and the uprights that support the back.

Any available softwood will do for the remaining frame parts. To keep ripping to a minimum, standard softwood widths are specified where possible.

You may find that any of these units are more comfortable with the back legs cut off shorter to provide some pitch. By all means treat them this way—unless the sofa is to be used for sleeping.

You might also like to substitute wrought-iron legs for wooden ones. The furniture is designed to take manufactured legs, either wood or metal, as well as lathe-turned ones.

Upholstering. The back and arms are padded with foam rubber 1" thick. For the chair you can use a standard-size rubber cushion that comes in a 4½" thick-

[*Continued on page 252*]

SCIENCE
REG. U. S. PAT. OFF. Monthly

Police use new weapons in

The War to Save Lives

Washington State has cut highway deaths 50 percent in three years by spying on traffic violators from the air, catching speeders with radar and telltale cameras, trapping drunks with surprise roadblocks.

NO HOLDS ARE BARRED in Washington's battle to prevent motorists from killing themselves and others. Led by a determined governor and backed by an aroused public, state patrolmen use the Trafficamera car (above) and many other modern devices to nab reckless drivers.

TO PREVENT MOTORTHANASIA, "the putting to death of a person by the use of a motor vehicle," Washington state patrolmen often resort to surprise roadblocks. Thus they weed out drunken drivers, defective vehicles and unlicensed drivers before they can become involved in accidents.

CAUGHT RED-HANDED by the Trafficamera, a speeder is photographed going 76 m.p.h. in a well-marked 50-m.p.h. zone. Time and date are recorded simultaneously with the scene and speedometer reading. Photos also aid Washington's intensive driver-education campaign.

WILL ENFORCEMENT HALT THESE SHOCKING LABOR DAY TRAFFIC DEATHS?

AIDING AERIAL SPOTTERS, who want to radio the nearest state cop when they see a driver violating a traffic law, all Washington patrol cars wear identifying numbers on their roofs.

1950	**389**
1951	**461**
1952	**432**
1953	**405**
1954	**364**
1955	**438**
1956	**???**

National Safety Council figures, covering the Labor Day weekend.

Crystal Ball Shows Air Force Cameramen Full View of Sky

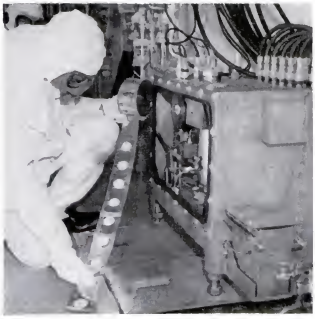
THEY shoot pictures with a crystal ball now at the AF Missile Test Center in Florida. A camera (left background in the setup above) snaps the mirror at top which reflects the sky as seen in the ball—and it comes up with a horizon-bounded view like that at right. Shots at 15-minute intervals help determine what filters and settings should be used in the photographing of missiles in flight.

Army's Mobile Photo-Mapping Lab Expands to Twice Its Size

HALTED at a strategic site for photo-mapping operations, this seven-foot-wide van can be expanded to 13½ feet. In just five minutes two men can crank out its aluminum sides on outrigger beams, swing hinged floor and roof sections into place and close the end panels. Heating and air-conditioning units are over the cab, power in a trailer. Army Engineers at Fort Belvoir, Va., developed the idea.

Atomic Suit Inflated with Conditioned Air

THE girl at the right, wearing an anti-radiation suit, is ready for her atomic job. Handling a Geiger counter and protected by the inflated plastic garment, she can detect floating radioactive particles without danger of contamination. Goodyear-made, the suit is air-conditioned for comfort.



Robot Halts Waste

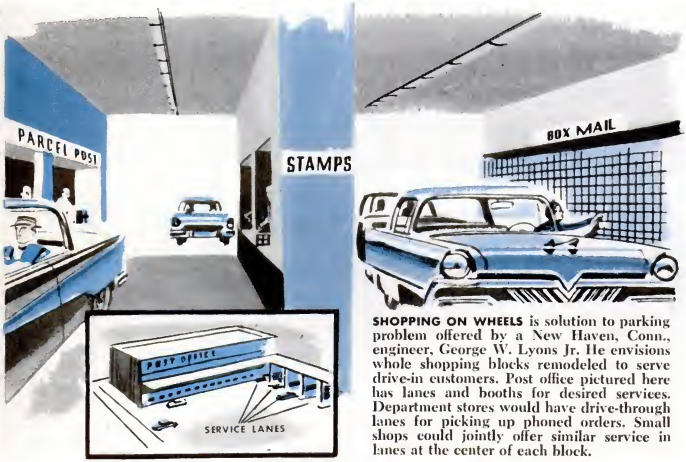
WHEN waste collected by this tape shows plutonium, the machine signals control engineers at the Hanford atomic plant. Prompt "leak" plugging saves GE $250,000 a year in lost nuclear fuel.

Eight-Wheeled Buick Rides Road or Rails

HYDRAULICALLY lowered, the flanged extra wheels fit this car for its regular inspection runs on the rails of the Burlington Railroad. Raised, they are out of the way for highway travel which saves doubling back over the track just covered. They provide no traction, just keep the tires hugging the rails.

What's Coming Next?

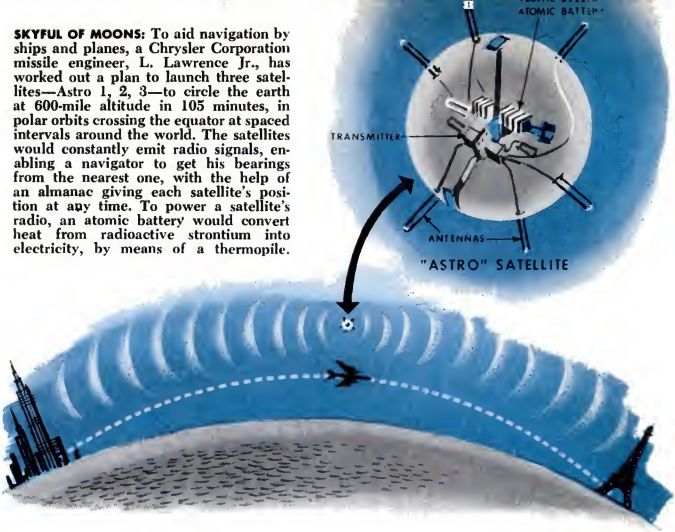
Here's a glimpse of some striking ideas for tomorrow's bigger and better world, as seen in an over-the-shoulder look at the drawing boards of the engineers and scientists who are planning it.



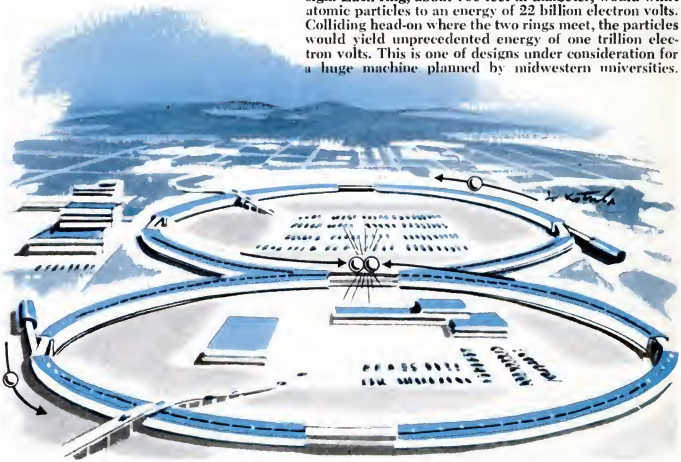
SHOPPING ON WHEELS is solution to parking problem offered by a New Haven, Conn., engineer, George W. Lyons Jr. He envisions whole shopping blocks remodeled to serve drive-in customers. Post office pictured here has lanes and booths for desired services. Department stores would have drive-through lanes for picking up phoned orders. Small shops could jointly offer similar service in lanes at the center of each block.

CARGO-CARRYING GUIDED MISSILES may be developed for military use. Delivering supplies by missiles to combat troops in hard-to-reach areas is foreseen by Army Lieut. Col. Robert B. Rigg. Warheads would be replaced with prepackaged ammunition, medical supplies, food and fuel, and the missiles would be remotely guided to the combat area, where they would be landed under the recipients' own radio control by means of portable field sets. Picture shows fuel delivery by missile.

SKYFUL OF MOONS: To aid navigation by ships and planes, a Chrysler Corporation missile engineer, L. Lawrence Jr., has worked out a plan to launch three satellites—Astro 1, 2, 3—to circle the earth at 600-mile altitude in 105 minutes, in polar orbits crossing the equator at spaced intervals around the world. The satellites would constantly emit radio signals, enabling a navigator to get his bearings from the nearest one, with the help of an almanac giving each satellite's position at any time. To power a satellite's radio, an atomic battery would convert heat from radioactive strontium into electricity, by means of a thermopile.



SUPER ATOM-SMASHER would have a figure-eight design. Each ring, about 700 feet in diameter, would whirl atomic particles to an energy of 22 billion electron volts. Colliding head-on where the two rings meet, the particles would yield unprecedented energy of one trillion electron volts. This is one of designs under consideration for a huge machine planned by midwestern universities.



Radar Builders Outfox

By Herbert O. Johansen

For thousands of men, home —a piece of geometry on stilts— is where you hang your parka.

SPREAD across the Far North, from Baffin Island in Canada's Northwest Territories to Point Barrow in Alaska, thousands of men in dozens of bustling construction camps are getting ready to face another Arctic winter. They are building a 3,000-mile chain of Distant Early Warning radar stations—the Dew Line.

A Dew Line main site, as visualized by an artist, shows a Sea Wolf amphibian in action.

the Arctic

Most of the Dew Line lies above the Arctic Circle, much of it never before trodden by man. It has tempted a few explorers and venturesome whalers, many of whom it has buried in frozen graves. The migrant Eskimos spend most of their time just keeping alive.

One of the toughest problems of this vast billion-dollar building project is battling the permafrost—ground that is permanently frozen to a depth of several hundred feet. In the brief summer, however, it thaws down a few feet, creating a mushy bog.

Conventional foundations are impractical. If a building were put directly on the surface, radiated heat would gradually melt the permafrost until the entire structure sank below the ground.

So in the flat tundra of Alaska and western Canada, the buildings are set on wooden piling. The holes for the piles, some of them 12 feet deep, are made by steam jets or earth augers. Around the piles, the frozen ground closes in with a grip more solid than that of concrete. Then modules, prefabricated plywood building units, are eased onto the piling, with a three-foot space between floor and ground.

The reason for this under-floor breezeway is twofold. It keeps heat radiated from the buildings from melting the permafrost; it lets snow blow through so that it won't pile up in high drifts.

In most of the Canadian sections, the foundations are gravel insulating pads, 12 feet thick, that keep the permafrost from melting. Here, again, the modules are set on a framework of stilts, three feet above the ground.

As the modules are delivered at a site (PSM, Aug. '56, p. 86), they are eased onto the foundation framework and set six inches apart. The six-inch spaces are then filled with vermiculite, as a fire stop.

Fire is feared in the Arctic as perhaps nowhere else—and for good reasons: lack

COMMUNICATIONS ANTENNAS are experimented with by electronics engineers as construction workers complete an auxiliary site. This type of site has a "building train" of 25 modules.

RIGID PLASTIC RADOME will go on platform of tower straddling building. It will house rotating search-radar antennas. Shaft in center gives access from inside for maintenance.

UNWIELDY MODULES had to be put together near sites in rugged Canadian areas. Here a finished unit, end poking out, is being towed out of a specially insulated assembly tent.

MOUNTED ON SLEDGES, modules are ready to be "cat-trained" by tractors across the frozen, snow-swept tundra of Alaska to isolated sites above the Arctic Circle. The boxlike modules, identical prefabricated plywood units that make up the Dew Line buildings, are insulated against below-zero cold, ice, snow and wind, measure 16 feet by 28 feet, and are 10 feet high.

of humidity in the air, a shortage of water, and high winds.

In a completed building, every sixth module is a special metal-bonded unit that serves as a firebreak between functional and living-area sections on either side. The plywood panels of all modules are treated with fire-resistant paint. In every module there are automatic fire alarms and fire extinguishers.

ESKIMOS along our top-of-the-world radar-warning fence are learning construction skills. Carpenter Charles Akwiana (above) works on an Alaskan site. He makes $4.20 an hour.

To heat the buildings in a land where 50-below-zero temperatures and howling 100-mile-an-hour blizzard winds are common, engineers of the Western Electric Co., prime contractor for Dew Line, came up with an ingenious system.

Using what the Arctic has most of—ice—they chop the stuff up, then heat it with the 750-degree exhaust gases from a battery of diesel-electric generators. Result: hot-water heating plus warm water for showers and washing.

The size of the buildings and the number of modules that make them up depend on their Dew Line job. There are three types of buildings:

Main sites. These are the largest. They consist of 53 modules, 26 in one and 27 in the other of two parallel buildings connected by an overhead covered bridge. Their detection equipment will consist of rotating search radar. In addition, they will have elaborate rearward communications equipment and facilities—hangars, big garages, storage areas—for resupply, service and maintenance of the smaller sites.

Auxiliary sites. These are made up of 25 modules in one train. Their radar equipment and electronic early-warning equipment and functions will be the same as that of the main sites.

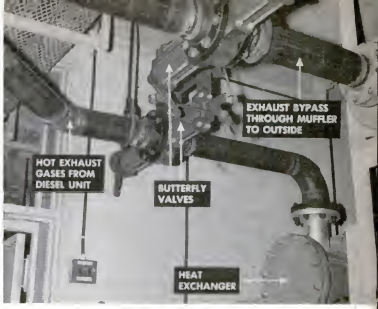
Intermediate sites. These are "gap-fillers," with five-module buildings and non-rotating radar. Their mission: to close the gaps where terrain difficulties made it impossible to space the other stations where their scanning coverage would overlap.

How much advance warning will Dew Line give us? The Air Force says that it can pick up the fastest jet bombers of today, even at high altitudes, in time to give industrial centers of the United States from four to six hours' notice of an impending attack.

One automatic feature of Dew Line's radar has been disclosed. It is an automatic alarm system that sounds off when a "blip" appears on a scope, indicating that an "object" has been picked up by the radar. Thus, since an operator will not have to sit with his eyes glued to every scope 24 hours a day, fewer people will be needed to work the stations.

Personnel manning the sites will be mostly civilians. Eskimos will be used wherever possible, principally for maintenance jobs. Air Force officers (Canadians in the Canadian sections) will be assigned to make military decisions.

Dew Line is in no sense a combat line. Any information picked up indicating the approach of hostile airplanes will be transmitted to Canadian and U.S. air-

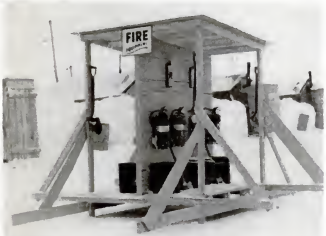


HEATING DEW LINE BUILDINGS starts with water from melted ice. The water picks up heat from hot exhaust gases of diesel-electric generators through this heat-exchanger system.

MOBILE HEATERS, known throughout the North as "Herman Nelson" heaters, burn gasoline or oil. They pipe warmth into modules under construction to permit work at minus 50 degrees.

GAP-FILLER, or intermediate, site is the smallest, consisting of only five modules. Its non-rotating radar will plug holes in the line. The barrels piled in the snow contain POL (petroleum, oil, lubricants), to keep machines moving and to provide life-sustaining warmth to men.

MAN'S WARMEST FRIEND in the Arctic is a Herman Nelson heater. Here a unit is unfreezing an engine of the C-124 Air Force Globemaster in which the author flew the Dew Line.



FIRE-FIGHTING STATIONS, with chemical extinguishers, stand along "streets" between temporary buildings. Water shortage and high winds make fire a grave hazard in the Arctic.

BORROWING FROM THE ESKIMO IGLOO, construction workers place blocks of compacted snow around their living quarters to keep warmth in. Entrance is an up-ended packing crate.

defense installations, such as the RCAF Air Defense Command, the U.S. Continental Air Defense Command and the nerve center of the Strategic Air Command.

Radio communication on Dew Line must be reliable. It is not, in the Arctic, because of magnetic storms. That is why parts of the communications system are designed for a new "scatter" technique, using Very High and Ultra High frequencies and parabolic antennas. Normally VHF and UHF have a line-of-sight range, a hundred miles or so. But by angling the signals upward, and turning on tremendous power, enough signal strength is reflected back by the upper troposphere and ionosphere layers of the atmosphere so that they can be received up to 1,200 miles away without atmospheric interference or interruptions by "blackouts."

When Dew Line goes into operation, it will complete a tight-knit network of early warning that an enemy will find hard to sneak through. The top-of-the-world radar chain has flanking arms down both sides of the continent. To the east of Baffin Island we have our Greenland radar installations. And it has been proposed that the Dew Line itself be extended more than 1,000 miles west along the Aleutian chain of islands to Attu, opposite the Soviet Kamchatka Peninsula.

Backing up Dew Line is the Mid-Canada Line, now under construction approximately across the 55th parallel. Below that is our third-team radar fence, the Pine Tree Line, stretching from coast to coast, roughly along the U.S.-Canadian border.

These are our lifelines of early warning against today's air weapons.

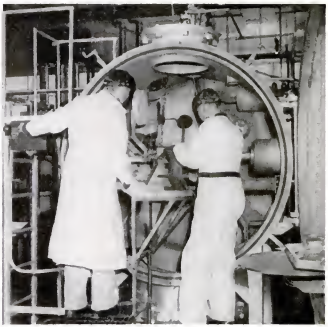
Aside from their value as warning signal of an enemy punch coming so that we can hit back fast and hard, our Arctic sentries serve another purpose, as pointed out by an Air Force general: "They will give civil-defense agencies time to undertake the necessary decisions relative to the safety of the civil population. This element of time may save millions of lives." END

Army's New "Sound Slicer" Cuts Quartz Without Touching It

SIGNAL CORPS scientists now get three times as many usable wafers of scarce, expensive quartz, vital for radar and guided missiles, out of the same block. The cutting head of the "sound slicer" (right) developed by Raytheon Co., Waltham, Mass., resembles a battery of razor blades. It shears mineral by ultrasonic impulses. The checker at left tests wafers, shown beside old-style blanks.

Push-Button Bar Mixes Drinks

THIS automatic bartender whips up a highball in three seconds, with just the right proportions of liquor and mix. The only trouble with the 200-lb. robot is that, unlike a flesh-and-blood barman, it can't listen to the customer's troubles and dispense helpful advice.



Furnace Stirs as It Melts

THIS water-cooled induction furnace, in use at the Babcock & Wilcox Co. plant at Lynchburg, Va., melts the special alloys that make the fuel elements in nuclear reactors. A motor-driven stirring rod insures that the different ingredients in each "melt" are thoroughly mixed.

New Supertankers Outgrow Harbors

TOO BIG TO LOAD INSHORE, the giant tankers take on oil from pipelines like this Near Eastern one jutting way out into the deep water from a long thin sandspit in the Persian Gulf.

Tankers have tripled in size in the last 10 years. Soon they may dwarf even the Queen Mary.

By David R. Lindsay

WHEN the latest queen of the commercial seas, the Sinclair *Petrolore,* made her maiden voyage to America recently as the largest cargo ship of any kind afloat, she couldn't get up the Delaware River. She was carrying a load of oil from Kuwait on the Persian Gulf for a refinery at Marcus Hook, just outside Philadelphia. With her full load she drew 40 feet of water, but the Delaware channel is only dredged to 35.

Just inside the river mouth she pumped about a third of her cargo of 16¼ million gallons to another tanker, the *Nashbulk.* Then both steamed upriver to the docks.

The choice of ship to do this lightering job was an ironic one. When the *Nashbulk* was built in 1945, she was the largest tanker in the world. As her skipper wryly remarked, "Eleven years ago a queen—now we are just a steam barge."

In that period the title of largest tanker in the world has changed hands so many times that, to quote one shipping man: "We'd read about a new record holder every week."

Cargo carriers are rated by the ability to lift a payload (deadweight tonnage in long tons of 2,240 pounds). The champion *Petrolore* has a capacity of 56,500 tons of crude oil, compared to the *Nashbulk's* 1945 record of 24,000. When the *Nashbulk* was launched she was considered a supertanker. Today

LARGEST CARGO CARRIER now in service is this tanker-ore ship, the Sinclair *Petrolore.* Tank and hold arrangement is shown in cross-section drawing. Pumps and conveyor-belt system, with a swiveling boom visible in photograph, make the ship entirely self-unloading with either cargo.

ORE-HOLD TANK
ORE-HOLD TANK
WING TANK
CENTER TANK
WING TANK

LONG NARROW CATWALK connecting the bridge with the deckhouse aft must be traveled by sailors to get to chow. These men are returning from a routine emergency drill while at sea.

PLOWING THROUGH THE WAVES, instead of riding over them, loaded supertankers can get plenty wet. Even in comparatively mild weather like this, the catwalk is frequently under water.

40,000- and 50,000-tonners are common, and the *Nashbulk* comes in the category of "little supertankers." There are some 70 supertankers of 30,000 tons or more in service, and more than three times that many under construction, on order, or planned.

The *Petrolore*, in fact, is about to lose her briefly held crown as the world's biggest cargo ship in actual service. An 83,500-tonner was launched last month at Kure, Japan—the first of two new supertankers of that size built by the same company that owns the Sinclair *Petrolore:* National Bulk Carriers of New York. (The Sinclair in her name comes from the Sinclair Refining Co., which has the ship under a long-term charter.)

A supertanker is a huge rectangular box, divided into smaller compartments so that oil won't slosh around and so that, if desired, several kinds of refined products can be carried at once.

At the front of this squared-off box is a more or less pointed bow (surprisingly blunt on the *Petrolore*), usually containing bunker oil for the ship itself and sometimes a small dry-cargo hold. At the stern there's space for engines, more bunker-oil tanks, and a house for crew's quarters. On a regular tanker there's another house amidships with the bridge and deck officers' quarters. On a combination tanker-ore carrier this house is way up forward.

The main body of the ship is a slab-sided, flat-bottomed tank, with valves and pipelines all over the place. There is a minimum of curves because the idea is to get the greatest volume without making the draft too great or the ship too wide.

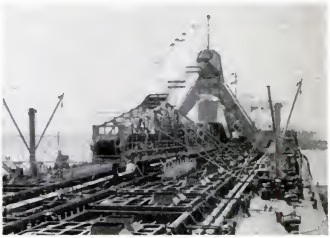
The *Petrolore,* with her 40-foot draft and 106-foot beam, can just squeeze through the Panama Canal with a load. The controlling depth in the canal is 41 feet, the lock width, 110. Even the *Queen Mary* and *Queen Elizabeth* draw a few inches less than 40 feet. In length, the *Petrolore*—789 feet overall—ranks sixth among merchantmen now in use, coming after the *Queen Elizabeth* (1,031), *Queen Mary* (1,020), *United States* (990), *Liberté* (937) and *Ile de France* (793), all of them transatlantic passenger liners. Only the two Queens are broader.

The 83,500-ton supertankers will be roughly 850 feet long, 125 feet in beam, with a loaded draft of some 47 feet. They'll be too big for any of the world's great canals and most of the world's harbors. The busiest port in the world—New York—is dredged to only 45 feet.

Tankers got so big because size saves money. An increasing share of America's oil comes from overseas fields—in the Middle East, Central and South America, and the East Indies. The oil companies just can't move it home fast enough. And what goes for the U.S.A. goes triple for Great Britain and much of the rest of Western Europe, which has to import almost all of its oil.

On the Delaware River alone there are today seven refineries in operation

SCRAPE AND PAINT is the order of the day at sea. The supertankers require no more men to run them than smaller ships but need extra hands to care for their huge metal surfaces.

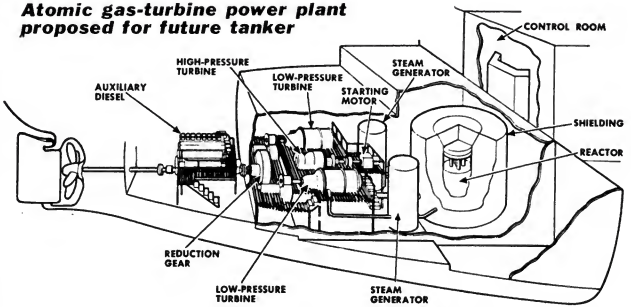


ORE-CONVEYOR BOOM on the *Petrolore* is shown here swung fore and aft above the tank deck when under way. The tank deck, as on all tankers, is a crowded maze of pipes and valves.

which can use a total of some 800,000 barrels of crude oil a day (a barrel equals 42 gallons), and another one is now being built. A full load from the *Petrolore* is about 400,000 barrels, half a day's supply for the whole river, less than four days for the Sinclair refinery.

But it's still a whale of a lot of oil. Carried by rail, it would fill 1,350 railroad tank cars making a train 10½ miles long. It would heat 2,000 small homes all winter, run 14,000 cars for a year—and still leave enough to operate a super-

Atomic gas-turbine power plant proposed for future tanker



Hot gas from a nuclear furnace, instead of steam from oil-fired boilers, may spin the turbines powering tomorrow's tankers. How it would work in a 707-foot, 38,000-ton tanker is shown in this sketch, based on a proposal to the U. S. Maritime Administration by the Ford Instrument Co. Ford Instrument engineers have planned a similar power plant to produce electricity for Holyoke, Mass. (PSM, May, p. 156). Gas carrying off heat from the reactor in a closed circuit turns both low- and high-pressure turbines. The propeller shaft is driven by the low-pressure units. The high-pressure turbine generates power for lights and other sources requiring electricity. Exhaust gases, before returning to the reactor, make steam that runs auxiliary machinery and heats the ship.

liner like the *United States* for a couple of weeks.

Ten years ago, 18,000 tons was considered pretty big for a tanker, but a modern ship of twice that capacity can cut transportation costs per barrel by about a third. It doesn't take so much more fuel to move the bigger ship, the crew is very little larger, and even the cost of building is not proportional to capacity. Some of the big tanker operators are now talking about ships of 100,000 tons, and a former shipper who is adviser to one large firm predicts that 200,000 tons may not even be the top.

At present, limitations are set by the problems of unloading and the availability of drydocks big enough to service these gigantic vessels. Lightering oil with "little supertankers" seems to offer a solution for the first. The drydock problem may be solved by building new docks. National Bulk is already talking about constructing a new shipyard from scratch in the West Indies. Loading the monster ships is not a problem because they generally take on oil offshore.

Life aboard a supertanker is acknowledged by seamen to be tough. The ships spend hardly any time in port; there's plenty of work to do; and there's always the danger of fire and explosion.

Pay and quarters, however, are much better than average. Compared to many of the newest tankers, the *Petrolore* is pretty Spartan, but she has only two men in a room, with separate rooms for each officer, and recreation rooms for officers and men.

At the top end of the luxury scale are ships like the Norwegian 34,320-ton *Jaragua*, finished last fall, which has separate wood-paneled staterooms for

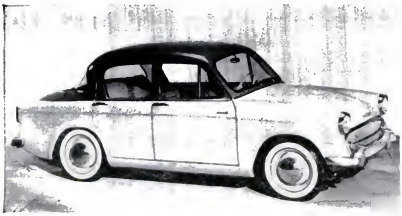
[Continued on page 292]

Automation Edges Out Tunesters, Writes Songs Wholesale

THE pianist above is playing a tune as it is composed by the electronic brain he gazes at wistfully. The complicated Burroughs machine can turn out 1,000 tunes an hour—all mathematically calculated to be popular. It picks off a series of coded numbers, matches them with melodic formulas, rejects sour notes.

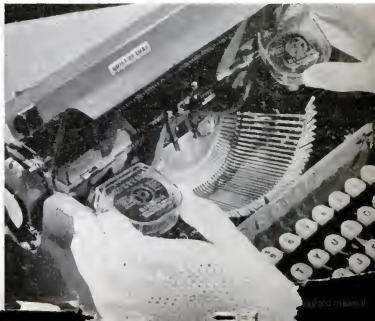
Ribbon Never Touched by Hands

THE white gloves below prove that changing a ribbon on a new Royal typewriter won't soil your hands. Modified guide slots on the machine catch up the ribbon when two plastic boxes encasing it are dropped over the spindles. The first key hit locks it in place.



British Chariot Swings Low

LOWER lines with no loss in ground clearance and more space for riders—that's the '57 Hillman Minx. A recessed floor adds head- and leg-room. The 35-m.p.g. car packs the same overhead-valve engine now boosted to 51 hp. by an 8:1 compression ratio. The new front end has independent wheel suspension.



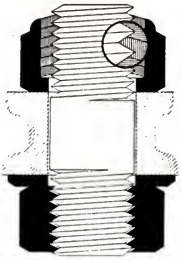
Loudspeakers to Blare by Land and Air to Warn of Attack

FEDERAL and local civil-defense authorities are testing the use of loudspeakers to supplement siren warnings.

In Operation Paul Revere (left) powerful sound projectors under the wings of a plane are ready to warn the public, control traffic and handle special situations. The range is better than a mile. In Operation Big Voice (right) speakers are banked on a Gary, Ind., hotel roof.

Remote Control Mans a Robot Camera in Television Studio

ONLY a TV actor appears in the photo at left above—there's no cameraman. The camera is fully operated from the remote-control panel at right. One technician there adjusts the focus, changes lenses, shifts shooting angles, operates film and slide projectors and controls all audio circuits. The system was devised by Kay Lab of San Diego when KSHO-TV in Las Vegas, Nev., went on 24-hour, three-shift telecasting without enlarging its staff of three technicians.



Disks in Hollow Nut Hold It on Tight

RESILIENT conical disks in the hollow British nut at top only wedge the nut tighter when it's shaken, unlike the solid nut below. The nut is made by Lester Lock Nut and Washer Co., Ltd., Wordsley.

Phone Booth Like Toadstool

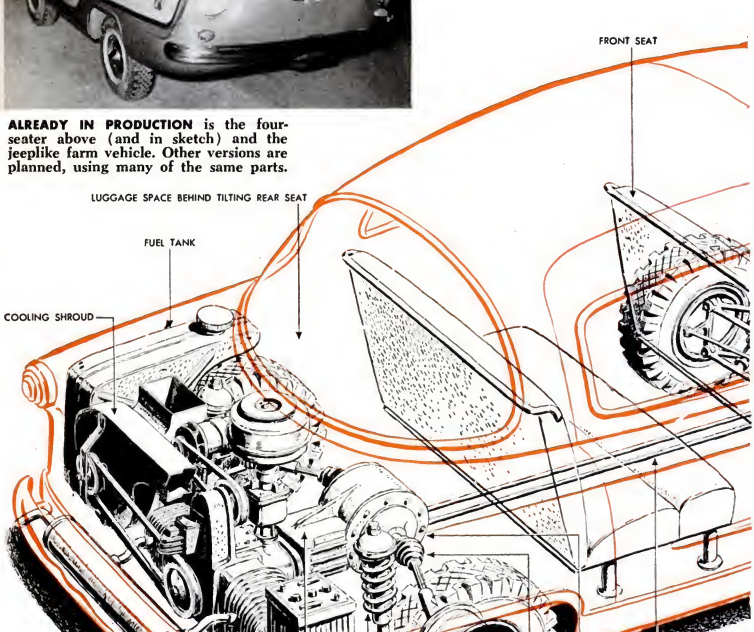
THE lady with her head caught in the free form at right is undergoing an ordeal no more serious than telephoning. Proposed by Petras Aleksa at the Illinois Institute of Technology, the booth would be cooler than conventional ones and is adaptable for future TV phones.

Monorail Hauls Construction Materials Anywhere on Job

A NEW hopper car on a rail automatically carries building materials to such work as the floor-pouring job below. Started on its way at the loading point, the Chain Belt Co. Railporter travels unattended to the site, where a stop-bolt trips its power and sets its brakes. Two men can lay its track in little time.

New Light

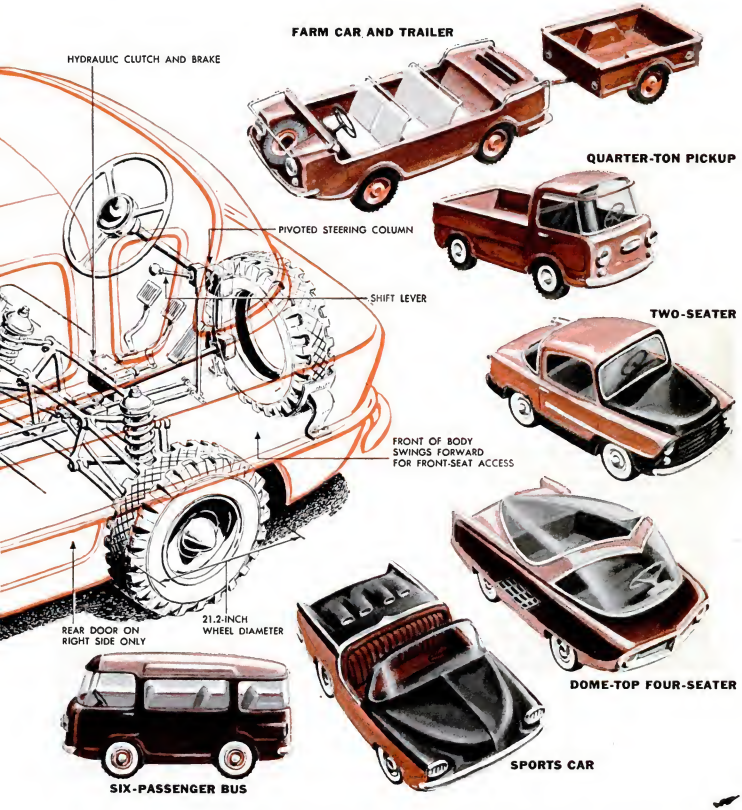
ALREADY IN PRODUCTION is the four-seater above (and in sketch) and the jeeplike farm vehicle. Other versions are planned, using many of the same parts.



TINY but tough, the new Russian "Squirrel" is a chunky sedan just 11 feet long. Designed for mass production by a motorcycle factory in the Urals, it has a curb weight of 1,624 pounds, can get up to nearly 60 miles an hour, and does about 40 miles to the gallon. The power plant, rear-mounted as a unit with a four-speed transmission and differential, has a displacement of 30 cu. in. and is rated at 20 hp.

Rear-seat riders get into the Squirrel by a single door on the right side. Access to the front seat is obtained by

Car: The Red "Squirrel"



swinging the front of the body forward; the wrapped windshield, the instrument panel, and the steering column all pivot down as the body section is opened. The car has unitized construction and is fitted with small but wide tires for good footing on soft ground.

The Squirrel (*Byelka* in Russian) uses components that are also designed to fit a whole family of special-purpose small vehicles. Different floor pans permit different wheelbases, and the engine output can be varied between 15 and 30 hp. by changing the bore. END

Chicago still blazed with nighttime lights when we loaded the VW with luggage at 4:30 a. m.

PORTRAIT OF THE PARTICIPANTS: From left to right—Henry Comstock, the air-conditioned Continental he drove from Chicago, Hubert Luckett, the little Volkswagen, Devon Francis.

Volkswagen Races 858 Miles, Gets 29.6 Miles Per Gallon

Trundling from Chicago to New York—within legal speed limits—a sturdy VW challenges the pace set by America's costliest car.

By Devon Francis
PS PHOTOS BY HUBERT LUCKETT

WELL, here was this Volkswagen and I looked at it and didn't say anything, and then I looked at Hubert Luckett.

Luckett is skinny. He stands six feet four inches barefoot and likes his comfort. If he could, he would take his meals lying down.

A Volkswagen is a German vehicle with four wheels, like a U. S. automobile, but there the resemblance ends. Under the hood where the engine should be, it isn't. In the back where the engine shouldn't be, it is. Compared with a U. S. car, a Volkswagen is *klein*, which is German for small, which is the understatement of the year.

Luckett ran a bilious eye over the VW.

"You mean," he said, "that I've got to ride all the way from Chicago to New York in *that?*"

We had topped off the gas tank. In driving up to the pump, I had overrun it

In the August issue of POPULAR SCIENCE MONTHLY *two staff members described a run at legal speed from Chicago to New York in a plush, $10,000 Continental. This month the same trip is made in a $1,495 rear-engine Volkswagen.*

SIX-FOOT-FOUR at the wheel. "Should I drive it like an automobile?" Luckett asked.

by several feet, and the attendant—with one hand—had pushed the car back into position. Luckett stood clear away from the car.

"Pretend you don't know me," he said.

It was now 4:48 a.m. (5:48, New York time) of a coolish morning on Chicago's South Side. I got into the car. That wasn't hard. I'm only five feet, seven and a half. But Luckett's getting aboard was a production. He opened the right door, backed on to the seat, scissored his legs and somehow got himself stowed in. He sighed audibly.

I fired up, slipped the thing into gear and we were off. We would make New York as fast as we could within the restrictions imposed by the speed laws. We would count fuel and food stops in our elapsed time but would subtract time out for an overnight stop.

A Volkswagen runs sort of like a sewing machine. In traffic, you have to keep shifting gears, one-two-three-four, back to two, up to three, down to one again. That's because the vest-pocket engine has scant torque at low r.p.m.

Traffic was light. In 10 minutes, taking advantage of the VW's short wheelbase and excellent maneuverability, I had wheeled around a half-dozen other cars. In 20 minutes, we were out of Chicago. The Continental had taken an hour—in heavy traffic—to go the same distance.

"Maybe," I said, "we can beat the Continental's time to New York."

"If I get out and run alongside?" said Luckett.

At 7:28 a.m., by the multi-dialed chronograph on my wrist, we were well into the black-loamed Indiana farming country. I braked to a stop.

"You try it," I said.

We switched seats. Luckett shoved the left bucket as far back as it would go.

"Hmm," he remarked. "Good leg room."

I should push my luck? I kept mum.

We were making pretty good time, despite a series of road repairs and a halt for a freight train at a grade crossing.

"***Nice box,***" said Luckett. "Shifts fine." Then, evidently in a panic of anxiety lest

NARROW, TWO-WAY ROADS in Indiana slowed the VW's progress to a mere crawl now and then.

Take a look at America's

Pennsylvania's curvy turnpike was liberally

FAN BELT on the VW's air-cooled engine got a tension check when we stopped at Pittsburgh.

REAR VIEW on the Ohio Turnpike—another VW, with luggage on top, *five* passengers aboard.

BUG SPLATTERS took scrubbing. Despite VW's aerodynamic looks, it seemed to attract them.

countryside through a Volkswagen windshield

supplied with big trucks. We overtook 189, plus 127 passenger cars. Six trucks, 88 cars passed us.

SEVEN TUNNELS pierced the Alleghenies, and we had to slow down to 35 miles an hour.

ROAD REPAIRS flagged us down, too. All told, we had eight miles of one-lane traffic.

GAS TRUCK above restored a pulse to our mount. A service charge of $3, by the way, was added on to the cost of the fuel.

MANHATTAN SKYLINE peeked over the New Jersey hills as we cov-

Then we dummkopfs ran out of gas almost within

he overdo his concessions, he added, "Lot of wind-wander, though. Steering's too fast at high speed, too."

We were learning other things about the car. We had to drive it. A big car has the inertia of mass; it helps drive itself. This one was a handful. Moreover, in passing on a two-lane road in a big car with plenty of power, you can use every fair-sized opportunity. With the VW, we lost time because we tended to hang back when the opportunity offered. The engine didn't have the top-range oomph for offhand passing.

Still we sped on. Another VW passed us going in the opposite direction. The driver flashed his lights and beeped at us. Luckett flashed his lights and beeped back. I didn't look at him. I was sure he would turn red-eared.

At 10:19 Eastern Daylight Saving Time, we flushed the west gate of the Ohio Turnpike.

"I figure that right now we're 57 min-

HOW THEY COMPARED

	VOLKSWAGEN	CONTINENTAL
Elapsed time, Chicago-New York	17 hr., 11 min.	17 hr., 18 min.
Mileage traveled	858	864
Average speed	50.05 m.p.h.	49.7 m.p.h.
Fuel cost	$8.07	$19.53
Miles per gallon	29.6	14
Car weight	1,609 lb.	4,960 lb.
Engine	OHV 4-cyl. horizontally opposed; 36 hp.; displacement 72.7 cu. in.; bore and stroke, 3.03" by 2.52"	OHV V-8; 285-plus hp.; displacement 368 cu. in.; bore and stroke, 4" by 3.66"
Transmission	4-speed manual	Torque converter
Springs	Torsion bar, all wheels independently sprung	Coil, front; semi-elliptic, rear
Inside dimensions	Front seat width (split), 19" each, rear 52"; leg room, front 43½", rear 36½"	Front seat width, 59.6", rear 56.9"; leg room, front 42.7", rear 40.6"
Outside dimensions	Height 59"; length 160"; width 60½"; wheelbase 94½"; tread, front 50¾", rear 49⅛"	Height 56"; length 218.4"; width 77½"; wheelbase 126"; tread, front 58½", rear 60"

ered the last turnpike lap on a six-lane road at 60 miles an hour.

ON THE GEORGE WASHINGTON BRIDGE we were two minutes from New York. Luckett's alarm clock and a stop watch are at the right.

sight of the spires and minarets of New York

utes ahead of the Continental's time," I said after comparing notes.

"Umm," said Luckett.

On the turnpike, the VW permitting, we could fly. I had asked Import Motors of Chicago, the firm that had lent us the car, how fast we could drive it.

"Flat out all day long," we were told.

Our speedometer error had been determined. At an indicated 55 miles an hour we would actually be making 50; at 60—54 m.p.h.; at 65—60 m.p.h.; at 70—64 m.p.h. The Ohio Turnpike speed limit for passenger cars is 65.

Luckett put the accelerator on the floorboard. The needle began winding up. The engine ran quietly, but the transmission emitted a faint whine. We hit an indicated 70 miles an hour—true 64—and stayed there.

At 10:40, five hours and 52 minutes, and 206 miles, out of Chicago, we rolled off the turnpike and on to a filling-station plaza. We had averaged a shade over 35 m.p.h., most of it on two-lane roads, fighting oncoming traffic.

I had asked Import Motors what octane to feed our little engine.

"Any you can get," was the answer. "It will burn anything but wood shavings."

As the gas jockey refueled us, he asked, "You mix your oil and gas in this thing, like in an outboard?"

Luckett gave him a withering look.

The tank had taken 6½ gallons of nonpremium fuel. We were getting 31.7 miles per gallon.

[Continued on page 296]

WELL, THAT WAS IT. The walls of Manhattan's canyons rose sheer above the Volkswagen.

Popular Science Speedometer-Check Chart

How Fast Are You Really Going?

Does your car keep pace with your speedometer when you open it up? The chances are that it doesn't; most speedometers read high, with the error increasing in the upper speed ranges—the faster you go, the greater the error. (There's a widespread belief that the makers build them that way on purpose, for safety reasons.) To learn the truth about your instrument, you need only 1) a measured mile or highway with mile posts, 2) a watch, and 3) the conversion table at right.

INDICATED (SPEEDOMETER) SPEED

35	40	45	50	55	60	65	70
98	86	76	68	61	56	51	47
36.7	41.9	47.4	52.9	59	64.3	70.6	76.5
99	87	77	69	62	57	52	48
36.4	41.4	46.8	52.2	58.1	63.2	69.2	75
100	88	78	70	63	58	53	49
36	40.9	46.2	51.4	57.1	62.1	67.9	73.5
101	89	79	71	64	59	54	50
35.6	40.4	45.6	50.7	56.3	61	66.7	72
102.9	90	80	72	65.5	60	55.4	51.4
35	40	45	50	55	60	65	70
104	91	81	73	67	61	57	53
34.6	39.6	44.4	49.3	53.7	59	63.2	67.9
105	92	82	74	68	62	58	54
34.3	39.1	43.9	48.6	52.9	58.1	62.1	66.7
106	93	83	75	69	63	59	55
34	38.7	43.4	48	52.2	57.1	61	65.5
107	94	84	76	70	64	60	56
33.6	38.3	42.9	47.4	51.4	56.3	60	64.3
108	95	85	77	71	65	61	57
33.3	37.9	42.4	46.8	50.7	55.4	59	63.2
109	96	86	78	72	66	62	58
33	37.5	41.9	46.2	50	54.5	58.1	62.1
110	97	87	79	73	67	63	59
32.7	37.1	41.4	45.6	49.3	53.7	57.1	61
111	98	88	80	74	68	64	60
32.4	36.7	40.9	45	48.6	52.9	56.3	60
112	99	89	81	75	69	65	61
32.1	36.4	40.4	44.4	48	52.2	55.4	59

How to Use the Chart: Drive a measured mile, concentrating on keeping at one of the indicated speeds at the top of the chart. Have a friend time the run with a stop watch, or a watch with a sweep-second hand. In the row below your indicated speed, find the number of seconds (colored type) it took you to cover the mile. Your true speed is the black figure in the same box. The chart also shows you, of course, how fast you were traveling over *any* mile, even if you didn't watch your speedometer.

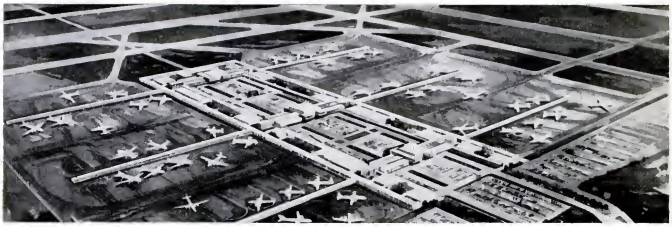
Waving Robot Invites Motorists To Stop for Gas

A ROBOT flags down motorists passing a gas station on the Newton Abbot-Torquay road in England.

A directional mike picks up and amplifies motor sounds to trigger a compressed-air-operated mechanism. An electronic circuit keeps the arm wagging when traffic is bumper to bumper.

No-Shift Tractor Runs On Motorized Wheels

THIS experimental British diesel tractor uses hydraulic pressure to drive "motors" in the rear wheels. Five cylinders, rotating around a stationary crankshaft, are the spokes. The two motors, connected in parallel, divide pressure between them—as one of the wheels slows down, the other wheel speeds up. A variable-output pump drives oil through the system.



Los Angeles Lays Out Airport for Modern Jet-Age Transportation

PREPARING for jet and atomic planes, Los Angeles plans a $50,000,000 expansion of its International Airport. Included in the approved model above of the 228-acre terminal are six two-level loading and unloading platforms, parking space for 9,000 cars, and new runways to handle up to 120 planes an hour.

Will NIKE Protect Us

YES SAYS ARMY

It can reach, outmaneuver and destroy any aircraft either available or under development at the present time, and bat down any Russian bomber in existence or heard about, says Army Secretary W. M. Brucker.

Named, perhaps optimistically, for the Greek goddess of victory, Nike, a supersonic guided missile that is at present the last-ditch antiaircraft defense of 18 of our most strategic cities, is under hot critical fire. This liquid-fueled missile, about 20 feet long and one foot in diameter, with a disposable booster for hurling it upward to a speed of 1,600 m.p.h., is

DEPENDING on the Nike to defend our chief target cities from close-in enemy air attack is putting our trust in a bust, the Air Force alarmingly declares.

Is that true? Have we spent more than a billion dollars (estimates run as high as four billion) for antiaircraft weapons that can't reach hostile planes before they have dropped their nuclear bombs?

Are we relying on second-rate guided missiles that aren't accurate enough or fast enough to intercept tomorrow's, or even today's, jet bombers?

If the answer to these questions is yes —as the Air Force says it is—then we have thrown away a staggering sum of tax money and lie relatively as defenseless as if we hadn't spent a cent.

But *is* the answer yes? Only the Defense Department, whose Army developed and mans the Nike and whose Air Force rejected the weapon as inadequate nine years ago, can say authoritatively. And so far Defense hasn't said, except in feeble words unsupported by any really convincing proof.

THE most optimistic defender of the Nike seems to be Secretary of the Army Wilber M. Brucker. At separate times, he has called it "a deadly missile which can reach, outmaneuver and destroy any aircraft either available at the present time or under development now," and "able to bat down any Russian bomber in existence or heard about."

Army Chief of Staff Gen. Maxwell Taylor considerably watered down Mr. Brucker's reassuring statements, however, by declaring:

"Nike is just, you might say, the four-cylinder edition of a family of weapons which will soon pass into the six-cylinder and eight-cylinder stage."

While we wait for somebody to come up

from Red Bombers?

NO

SAYS AIR FORCE

Its range is so short that it couldn't intercept and kill an attacking bomber until the plane was almost on top of its target; its ground-based radar controls are vulnerable to jamming; its accuracy is unproved, contend Air Force critics.

radar-controlled from the ground. It is supposed to be able to destroy any enemy plane within bombing range. Can we depend on it or is it merely giving us a false sense of security?

While America awaits the authoritative answer to this question, which may mean life or death to our nation, we present to readers of POPULAR SCIENCE MONTHLY the status of the Nike today.

with all the facts, we can't be blamed for trying to find out the truth for ourselves.

WHAT about the Nike's range? The Army officially has stated that it is "over 25 miles." But the Air Force counters with the fact that guided bombs can be released from planes 50 miles from their targets. Nike B will take care of those planes, the Army retorts.

What is Nike B? It is a greatly improved version of the present Nike, with a vast increase in range and a nuclear or thermonuclear warhead, the Army explains. What will its range be? The Army hasn't been allowed to say, but expert estimates agree that it will be close to 60 miles. That would seem to take care of the planes releasing guided bombs, but is Nike B in production? No. It is still in the development stage.

The Air Force declared that even if Nike B were in production, we'd still be behind the eight ball, because Nike B can't use the elaborate and expensive launchers and electronic control system now in place for the original Nikes.

Is this true? The Army hasn't been permitted to reply, but a well-informed source has said that the Air Force claim is "scurrilous nonsense"; the launchers were designed with Nike B in mind and a changeover to the new-model "bird" can be made with ease and comparatively light expense.

WHAT about the Nike's accuracy? At a demonstration for the press at White Sands Proving Ground, N. M., the Army fired eight Nikes. One developed electronic trouble and automatically blew itself up. Seven were declared to have scored hits. One hit was a bull's-eye.

However, only two Nikes were fired at a drone target moving at jet speed. The first Nike exploded close enough to the drone to pepper its belly with shrapnel and send it parachuting to earth. The

If Air Force is right...

Then Washington, our nerve center, and all the great industrial cities vital to mounting counter-attacks are vulnerable to H-bomb raiders.

Army scored that as a hit, and said that the second Nike would have hit the drone if the first one hadn't already done so.

The other Nikes were fired at slow-poke drones that could travel no faster than an early World War II bomber. All of these drones received shell-fragment wounds and one of them was hit squarely and destroyed. No drone flew an erratic course, as an attacking plane would.

In fairness to the Army, it must be pointed out that these target drones were scarcely one-tenth the size of a probable enemy bomber. On the other hand, they were moving less than one-third as fast as that bomber would be traveling.

Realizing that this demonstration of the Nike's accuracy was not impressing its watchers, the Army explained that the weapons had been fired successfully at many types of jet aircraft as fast as anything in the skies today.

HAD the planes been destroyed? Not actually, of course, the Army said, but its technicians had convinced themselves that they could have been. You see, it is possible to adjust a Nike's internal guidance system so that it makes a deliberate, specific error in responding to an electronic command. A crew can then fire the bird at, say, a B-47 with the assurance that they will miss it by a safe but predetermined distance. They can also measure the area of the burst when the missile's warhead explodes. Therefore, all they have to do is subtract the margin of error that they set into the missile's guidance system to find out how much damage the burst *would have done if* the missile had been set accurately.

If Army is right...

Attackers that sneak through our screen of defending planes will be safely destroyed, regardless of height, speed or evasive action, before they can loose bombs.

Using this technique, the Army says it has proved, to its own satisfaction, that it could "bat down" anything that flies today or is likely to fly in the near future.

But the Nike is controlled from the ground, by radar. An enemy would unquestionably try to jam the radars. What, asks the Air Force, becomes of Nike's accuracy then?

What we ought to have, the Air Force says, is an antiaircraft missile with a homing device in its nose. Such a missile would unerringly and automatically close on its target, invulnerable to jamming and independent of ground controls.

That makes sense. Does the Air Force have such a missile? Indeed it has. The Navy-developed Talos. What is the range of the Talos? About 60 miles. But is it in production? No. Are there any launching installations for it? No.

WHAT about the Nike's speed? There doesn't seem to be any ground for Air Force complaint on that point. Within a few seconds after firing, a Nike reaches a speed of around 1,600 m.p.h., fast enough to intercept anything that is likely to be flying for some time to come.

But will the Nike protect us from attack by the Reds?

Yes, if you are willing to take the Army's word for its effectiveness, but so far few outside the Army are convinced.

No, not if an attack should come right now, for even if we ignore the Air Force's sharply expressed doubts about the Nike's accuracy within its range, no one has disputed the Air Force statement that bombs can now be released 50 miles from their targets. No Army spokesman has stepped forward to maintain that today's Nike can shoot that far. END

Radio Fisherman Goes

Using an antenna instead of a rod, Ed Phillips sends his model tug to catch and play the fish.

FISHING by radio sounds like a lazy man's dream, but it's too much fun to sleep through. Without stepping off dry land, Edward F. Phillips, of Newington, Conn., can head his model tugboat out where the big ones are. By fingering a transmitter button he can turn, stop, back up or drive the boat full speed ahead to play a hooked fish.

An electrician by trade, Phillips has

AN AUTOMATIC REEL is mounted on the afterdeck. The 6-lb. line passes through a tip eyelet on the stern rail. A fish hitting the lure can pull out line, but spring reel hauls it back in as the fish tires out. A block on the line stops it before the 10-foot leader is reeled in.

ENGINE ROOM is crammed with both dry and storage batteries, a large drive motor and two small auxiliary motors for steering and changing speed, and four control relays. The hull frames were cut from plywood and planked with wooden strips from window blinds.

SKILLED MODELMAKING is evidenced by such details as furniture, a midget fan, chronometer and compass in the chartroom and captain's cabin. Extinguishers are made of lipstick cases.

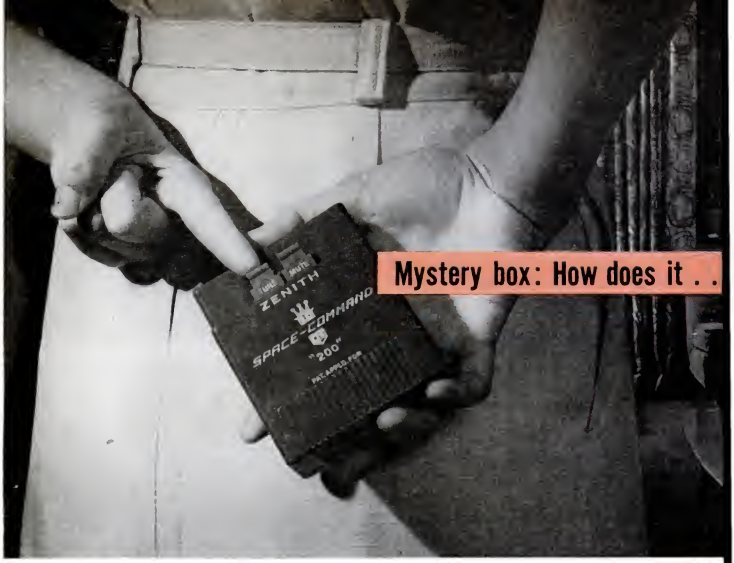
DECK DETAILS are compounded of common materials and uncommon ingenuity. Rails are welding rod, portholes old spark-plug gaskets, fenders toy auto tires. Parts came mostly from scrap.

Trolling from Shore

invested a year's spare time and about $100 in the *Beatrice M*, a five-foot craft controlled by a single-channel transmitter on the 27-megacycle citizens' band.

Short taps on the single control button swing the rudder. At extreme left rudder the main motor shifts to full speed; at extreme right, to slow speed. A horn sounds at both extremes to tell the operator what's doing.

Slightly longer signals are used to start, stop and reverse the tug. In reverse, instead of the horn honking a bell rings at both rudder extremes. END



Mystery box: How does it . .

New Electrical Wonders

How do they work? Take a look inside the wireless TV control, switchless lamp, cordless clock.

By Martin Mann

AMAZE your friends! Just look at the TV and make it change channels or silence the commercial—while your hands are in your pockets. Make a lamp light when you wave your hand and mutter abracadabra. Lift the electric clock, its second hand sweeping merrily —but look, no wires!

Magic? Yes, sir. But not the kind you laboriously rig up yourself. These are new commercial marvels, available in stores around the country.

Take that TV trick. A more mystifying act of electronic wizardry never helped a TV salesman con a shopper out of several hundred bucks. The gimmick is a remote-control unit small enough to fit in your pocket. When you push a button, the TV set changes channels. Another button lets you silence the commercials.

This eerie control works, we found, even if held behind your back, in your pocket, or at the other end of the room from the TV. You don't have to aim it at the receiver.

It has no wires, no tubes, no batteries, no electricity at all. The manufacturer, Zenith, solemnly assures that "it emits no radiation harmful to human beings."

Work Living Room Magic

We took one apart, and by gosh they're right. It won't even harm dogs or cats. Inside the case are some metal rods, similar to the tuning forks that piano tuners use. The push buttons release tiny hammers that strike the rods and make them ring, in ultrasonic tones so high in pitch that they cannot be heard. These sound waves vibrate about 40,000 cycles per second, twice as high as the shrillest note people can hear, and too high even for dogs—we tried it.

The television receiver that dances to this silent music has a microphone to pick up the ultrasonic tones, and a five-tube electronic brain to amplify the signal and figure out what you want done.

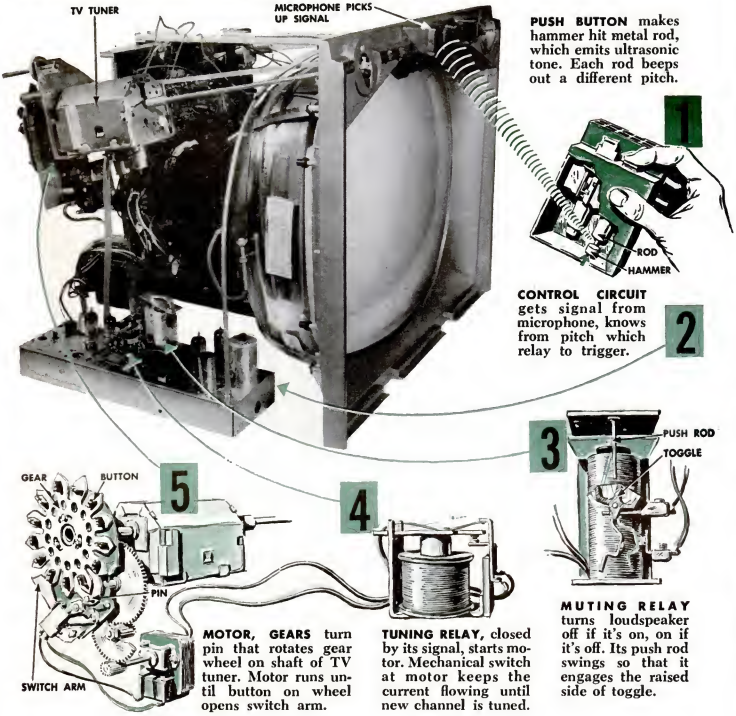
The five-tube brain separates the signals according to their frequency. The muting signal goes to a tricky relay that turns a toggle switch off if it's on, on if it's off. The station-changing signal works another relay that, in turn, puts an electric motor and gear train to work turning the selector knob.

Rube Goldberg himself might have invented that one. You can show off this kind of wizardry for $250 up.

The "switchless" lamps really have switches, of course. They're new kinds that don't look at all like switches. The trickiest is called Touchtron. You touch your hand to the lamp base and the light goes on; touch again and the light will go off.

The secret is a vacuum tube, relay and

Beeps of silent sound control this television set

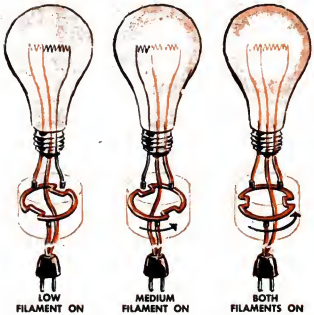


condenser inside the lamp base, plus a metal ring that looks like decoration around the lamp. The tube stays on all the time but burns only 10 cents' worth of electricity a year. Ordinarily it will not let enough current pass through to throw the switching relay. But when you touch both the lamp base and the metal ring, your hand completes a circuit. This decreases electrical impedance, the tube passes more current, the condenser fires, and the relay switches the lamp on (or off). There is no shock hazard.

Another new switch adds convenience to three-way lamps, the ones with bulbs that go low, medium or bright. Called a drum switch, it fits on any narrow part of the lamp body; it is not part of the socket and you don't have to reach under the shade to work it. It also operates in either direction—no more switching through the whole cycle to get the brightness you want.

The GE drum switch and the electronic Touchtron are available on numerous brands of commercial lamps, but neither is yet sold separately in hardware stores for homemade lamps.

Lamp gets bright, brighter, brightest with turn of drum



DRUM SWITCH becomes part of lamp body, lets you control bulb without reaching up under the shade for the socket. Moving part (left) is a metal ring that touches alternately either one or both of bulb contacts, giving low, medium, high brightness. Fourth position (not shown) makes no contact, turns lamp off.

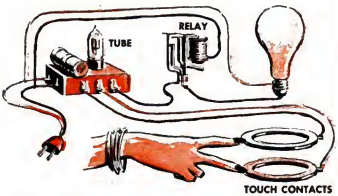
If you want a lamp that lights without any attention at all from you, a little plastic box does the job. Plug box into wall outlet, lamp into box, and the lamp goes on at dusk, off at dawn.

This magic box contains a photoelectric cell, a small wafer that conducts electricity well when light shines on it, not so well when no light hits it. During daylight, it passes enough electricity to hold open a relay, so that current cannot reach the bulb. When daylight dims, the photocell blocks current flow to the relay coil, the relay contacts snap shut, and the lamp lights. The photocell must be mounted at a window facing outdoors, but the lamp can be anywhere that its cord will reach.

Automatic switches of this type have long been used to control street lights. The home unit is now made by Fisher-Pierce Co., Boston 85, and costs $15.95.

The cordless electric clock uses the kind of magic that comes to real money. The clock costs $195, plus tax, and it won't keep better time than a four-buck kitchen clock with wires. But its eerie operation really triggers your take-it-

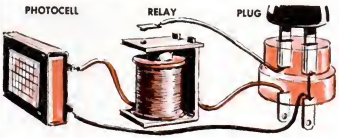
Magic touch is all it takes to make this lamp switch on or off



ELECTRONIC SWITCH operates when fingers bridge two separated metal parts of lamp base. Hand lowers electrical impedance of circuit, permitting a vacuum tube to pass enough current to trigger a relay. The relay contact latches in the position it is pulled to—one impulse snaps it on, the next impulse snaps it off.

You needn't even touch this lamp switch—it works itself

PHOTOCELL SWITCH turns lamp on when you need light, off when you don't. Box at house window contains a light-sensitive cell that increases its electrical resistance when less light hits it. Dimming daylight reduces current flow to a relay, letting contacts snap shut and turn the lamp on. Increasing daylight at dawn increases current flow and forces the switch open.



apart instinct. Only after considerable prodding from PSM would General Electric declassify the details.

The wireless clock *is* wireless—it's radio-controlled. It does not depend on signals from ordinary radio stations, but on the 60-cycle electromagnetic waves that are always radiating from ordinary wiring and appliances.

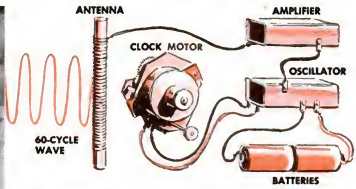
Inside the clock case is an antenna—just like the ones in small radios—that picks up the 60-cycle radiation and feeds it to an amplifier. But a whole raft of amplifiers couldn't boost the airborne signal enough to drive even the flea-power clock motor. That's where the trick comes in.

The amplified 60-cycle signal controls the frequency of a battery-powered local oscillator. Now the oscillator frequency may vary, but the power-line frequency picked out of the air won't. So the two mesh, and the oscillator locks in with the 60-cycle radiation from the air.

The oscillator output drives a synchronous clock motor. That way the clock motor, although battery-operated, gets 60-cycle power just as precisely regulated as the house current that runs ordinary electric clocks.

What will they think of next? The electronic wizards are busily contriving still newer magic to pop the customers' eyes. The trick we'd like to see is a TV control—with or without wires—that not only picks out the programs but also tells you in advance whether or not the show is going to be any good. END

For $195 you can have an electric clock without wires



CORDLESS CLOCK runs on batteries but has precisely controlled AC synchronous motor. The batteries power an oscillator. To hold oscillator exactly at 60 cycles for good timekeeping, its frequency is locked in with the 60-cycle power-line frequency by electromagnetic waves that are picked up from the air. The 60-cycle waves are stray radiation from house wiring.

Grand Prix Game Tests Players' Skill at Driving

THINK you can do better at Sebring or Watkins Glen than a Cunningham or Spear? Here's a chance to prove you can handle a Ferrari or Jag with the best.

Grand Prix, a racing game by Wright-Mudge Enterprises, Inc., of Fairfield, Conn., is a test for sports-car fans on authentic reproductions of road-race courses. A card game, it requires skill in actual racing situations.

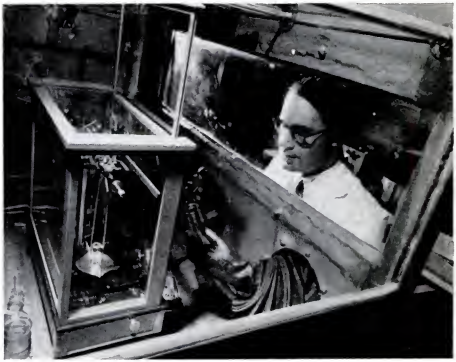
Energy from Sun Runs Model Aircraft Carrier

THIS model carrier skims over the water under sun power. Four silicon cells on its deck convert solar energy into electricity to turn the prop. The model was exhibited recently by Hoffman Electronics Corp., Los Angeles.

"Plastic" Magnet Has Super Power

A NEW method for producing highly purified manganese bismuth has led to the development of magnets 10 times more permanent than most of those now in use.

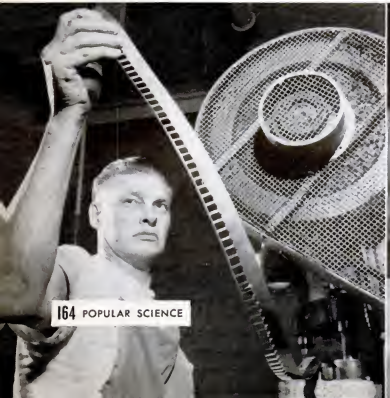
So combustible that it must be handled in a helium-filled glass chamber, as at right, the Westinghouse substance is made as a powder and molded in plastic. It can then be cut to any shape, including thin wafers.



HIGHLY MAGNIFIED IMAGE of the business end of a fountain pen, shown under inspection with the aid of a projector, serves to check the width of the slit cut in a fountain-pen nib.

STRIP OF 14-KARAT GOLD goes through a punch press that stamps out blanks for penpoints. Photos on this and the facing page were taken in the Sheaffer plant at Fort Madison, Iowa.

GRINDING AND POLISHING four penpoints at once, machine performs what once were hand operations. Shown being adjusted, it's an example of recent advances in pen making.



Things You Never Knew About Your Fountain Pen

A leaky 1884 pen let loose the flood tide of American ingenuity that has kept the world writing.

By Richard Match

FROM Murmansk to Timbuktu the American fountain pen, streamlined, durable and leakproof, is a symbol of U.S. technological excellence. After World War II our trim Parkers, Sheaffers, Watermans, Eversharps brought $400 each on the black market overseas. Today Japanese and Italian street vendors hawk shoddy counterfeits; the Russians turn out imitation Parker 51's which cost more than the real thing. But American manufacturers make 75 percent of the world's output—some 200 million pens a year.

The ubiquity of the American fountain pen still surprises even its export-minded makers. Before V-J Day, isolated Chinese and Burmese guerrilla outfits solved the medal shortage by awarding American fountain pens in lieu of decorations for valor. A New York *Times* correspondent tells of a British diplomat, some years ago, negotiating a treaty with a tribal chieftain at a remote North African desert outpost. When the time came for the formal signing, Her Majesty's envoy produced an inkwell and an old-fashioned dip pen. Signing his name with a blotchy flourish, the diplomat proffered his pen to the Arab leader. "No, thanks," said the Bedouin, "I have my own." From his burnoose he drew forth a two-tone American fountain pen, inked a fingertip and solemnly affixed his thumbprint.

Egyptian "dream" pen. The idea of a pen that could hold its own ink supply is one of writing history's oldest, most elusive dreams. Archaeologists have dug up a "fountain pen" of sorts—a hollow reed into which ink was poured—from an Egyptian tomb sealed around 4,000 B.C. But the fountain pen we know today is a

LIKE CANDLES on a birthday cake, penpoints go on plating rack. Masked with rubber, they'll be immersed in tank to get hard coating of palladium, from "heart pierce" to tip of point.

IN FADE-O-METER, dazzling artificial sunlight quickly checks light-fastness of colors for plastic pen barrels. This device also serves to test the permanence of liquid and ball-point inks.

monument to a middle-aged New York insurance salesman named Waterman.

In 1884 Lewis Edson Waterman, like every smart salesman of his time, carried on his watch chain a collapsible steel dip pen and a stoppered portable inkwell. This arrangement delighted no one but dry cleaners. Various so-called fountain pens, crude affairs with built-in ink reservoirs, had by this time appeared on the market and Waterman bought himself one. Soon afterward, as one of his prospects was about to sign an application for a large policy, Waterman tendered the fountain pen. Then came the deluge. The pen flooded the document, and Waterman's testy customer gave his business to a rival agent.

"Controlled leak." Sorely wounded in pocket and ego, Waterman quit life insurance and applied his natural mechanical talents to the invention of a practical fountain pen. It was easy enough to devise a built-in reservoir, but no pen had been invented that would deliver ink in a continuous flow, or "controlled leak," starting and stopping as required by the writer.

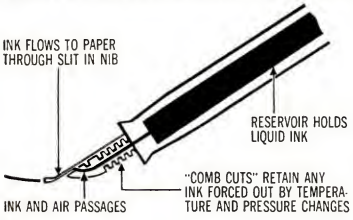
To ensure steady ink feed, Waterman decided to apply the principle of capillary attraction. He made a hair-thin fissure or capillary channel to lead ink to the penpoint, plus another channel to admit air into the ink chamber so that internal air pressure was balanced. Capillary attraction—the phenomenon that makes liquid ignore gravity when confined in narrow channels—keeps the ink from leaking out, except when the penpoint is in contact with some object. Patented in 1884, Waterman's famous "fissure feed" pen worked so well that its principle of ink control is still used in all fountain pens except ball points.

LIQUID-INK CARTRIDGE refills fountain pen without getting fingers inkstained. Several makers have introduced cartridge-filled pens, illustrated by the Sheaffer model in the photograph above.

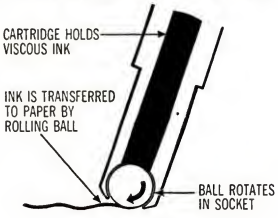
A fine fountain pen is a precision instrument requiring expert hand craftsmanship on tiny parts, sometimes fitted to tolerances smaller than those of a good watch. A typical conventional fountain pen has 36 parts and its assembly entails 300 operations. The penpoint or nib must be shaped with microscopic accuracy if the pen is not to leak, and is still preferably made of gold, which resists ink corrosion better than any base metal. Where it touches the paper, however, the point is tipped with a speck of extremely hard metal such as osmium, palladium, ruthenium or iridium—members of the rare and expensive platinum group.

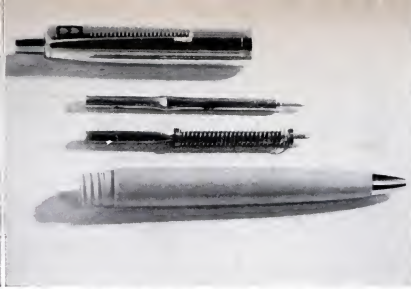
Ball points today account for four-fifths of our annual output of fountain pens. But Americans still buy about as

HOW A STANDARD FOUNTAIN PEN WRITES



HOW A BALL-POINT PEN WRITES





PAPER MATE'S newest ball-point pen has "Piggy Back" refill. Twin ink tubes, each with own ball point, fit one atop other for use. When one is empty, switching them renews the ink supply.

"SNORKEL PEN," a Sheaffer innovation, extends a retractable tube from its point to suck up ink, when barrel is twisted. Extended tube is magnified here several times its actual size.

many old-style liquid-ink pens as they ever did, many users preferring the flexibility, expressiveness and individuality of the conventional penpoint.

For lefties, too. At present you can choose a stock-model fountain pen from over 30 nib styles, running the handwriting gamut from the "accountant's hairline"—thinner than paper—through the "executive stub" and on to a "paintbrush" nib made for writing Chinese ideographs. There is even a left-handed pen, its nib especially ground to avoid scratching when it's held by a southpaw.

Once you've broken in your pen to your writing style, true pen artists urge you to reserve it for personal use. Another hand may change the "set" of the point, they say. Mary Roberts Rinehart, for example, writes with a 25-year-old favorite pen that no one else is ever permitted to touch.

Ball-point boom. Only four years after Lewis Waterman's invention, one John Loud applied in 1888 for a U.S. patent on a ball-point pen. But technical bugs stood in the way until 1945. Then, with a new design, the ball point zoomed to popularity and was hailed as the postwar "successor to the fountain pen."

Two years later the bubble burst. Fifteen-dollar price tags were slashed to 15 cents, but no one wanted the pens.

In a ball point, a ball revolving in its socket wipes thick, gelatinous ink from an inner reservoir onto the paper. The trouble was with the ink. It clogged, jammed or skipped; it rubbed over paper, wasn't water-fast, disappeared after exposure to sunlight. Moreover, a moist thumb could lift a signature and transfer it to another check or document. Forgers rejoiced. Some banks refused to honor checks signed with ball points.

Rescue for the industry came by way of a Hungarian chemist, Fran Seech, who had escaped from Nazi-occupied France and made his way to Los Angeles. Fired from a job with a ball-pen company when disaster hit the business, Seech rented a cubbyhole "laboratory" and attacked the ink problem. In 1949 he discovered the secret formula which, experts agree, saved the dying ball-point industry.

It stayed put. A young San Francisco businessman, Patrick J. Frawley Jr., secured the rights to Seech's untried new ink and began making a new ball pen which he called Paper Mate. Fortified with Seech's quick-penetrating ink, Paper Mate writing stayed put, neither blotted nor smeared. Frawley launched a spectacularly successful advertising campaign to win back the confidence of disillusioned buyers.

Free ball points were mailed to school principals and bank presidents. Full-page ads informed the public that "Bankers Approve." TV comics joked about Paper Mate's "70,000 words without re-

[*Continued on page 278*]

Outboard Watercycle Skims over Waves at 25 M.P.H.

LIFTED on miniature hydrofoils, this water "motorcycle" hits 25 m.p.h. and goes into a 45-degree bank without skid, says Hydrocycle, Inc., Madison, Wis. A 10-hp. outboard powers it. Future models will be faster, more streamlined.

Boat Compass Lights Up at Night

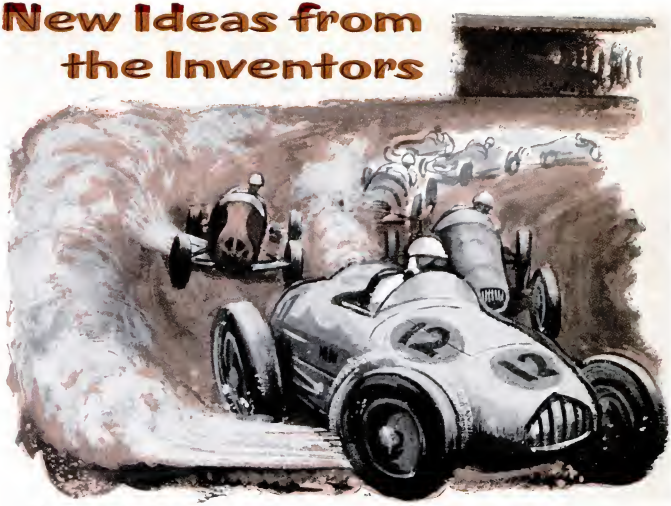
THIS little compass for small boats rides in a ball-and-socket bracket, gives steady readings in rough water, and has a built-in light. It is made by Taylor Instrument Companies, Rochester, N. Y.

Assemble-It-Yourself Outboard Has All-Purpose Power Head

OUTBOARDS now come in kits. This 2½-hp. model, capable of driving small hulls up to eight m.p.h., can be assembled at home with a screwdriver and a wrench. At around $60, it can save half the price of a factory-completed job. In addition, you can detach its engine and use it on a special power-takeoff mount to run a mower, generator, pump or saw.

The air-cooled, two-cycle, one-cylinder motor has a 1⅝-inch bore and stroke. It winds up to 3,750 r.p.m. The outboard is a product of Continental Mfg. Corp., Culver City, Calif.

New Ideas from the Inventors



1 Jets to Boost Car Speed. Expelling exhaust gases through steerable nozzles—according to this Daimler-Benz patent—could increase a car's speed and roadability. On straightaways, jet thrust would help propel the car; going around curves, outward-turned nozzles would brace it against centrifugal force.

2 Bottle to Form Its Own Straw. Liquid and gas sealed into this giraffe-necked container would stiffen its flexible—but non-elastic—walls. To drink from the bottle, you would break the neck seal and squeeze the liquid into your mouth through the drinking tube on top.

3 Motorized Pouch to Fill Pipe. With this reloading device on his dashboard, a pipe-smoking driver could fill his brier without taking his eyes off the road. Inserting a pipe in the base would energize the unit causing it to discharge and tamp a bowlful of tobacco.

Please turn the page for more new ideas

More New Ideas from the Inventors

4 Typewriter to Light Copy. A tubular light bulb inside this translucent typewriter roller would illuminate copy clearly. Designed as an aid in stencil cutting, the device includes an adjustable reflector that may be used to direct more light toward the typist.

5 Electric Vest to Relieve Ache. Buttoned on like a high-necked sweater, this heating pad would help ease aches and colds in the chest, shoulders, neck, and ears. The form-fitting heater would warm areas that can't be kept properly covered by ordinary flat pads.

7 Single Outboard to Have Two Props. Two contra-rotating props mounted on an adjustable hydrofoil would cancel the torque effect of a single prop, which tends to lift one side of an outboard higher than the other. The foil could be pitched at the proper angle to plane the boat at various speeds.

6 Pad to Rest Driver's Leg. Your gas-pedal leg gets tired on long drives, says this inventor, not because it is immobile, but because of its tendency to move sideways. By steadying your knee, this adjustable, swing-out pad would ease the muscular strain.

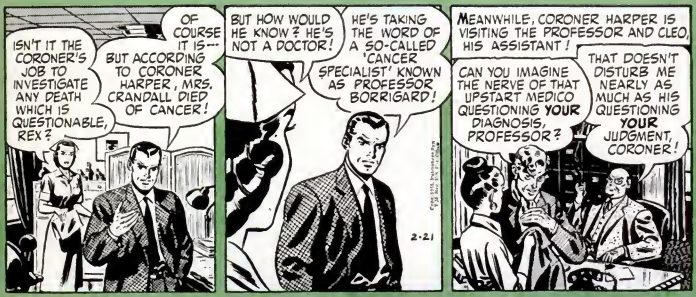
8 Brushes to Help Cleaner Clean. The extension nozzle of an upright or tank-type vacuum cleaner might pull in more dirt if it had a set of rotary brushes like this. Traction wheels would ride against the rug; through idlers, they would spin spiral-bristled brushes that would stir and loosen carpet dust.

9 Air Line to Fly Model. Sacks expanded and contracted by air squeezed from a bulb through a plastic line would move the control surfaces on this model plane. Thus, control could be maintained with a slack line; whereas tension is necessary with conventional lines.

The following patents *have been issued on these inventions: 1. Patent No. 2,724,450 to Reinhold Kamps, Stuttgart-Bad Cannstatt, Germany; 2. No. 2,713,543 to Leo Peters, Evanston, Ill.; 3. No. 2,731,187 to Alphonse Marquis, Sanford, Maine; 4. No. 2,703,636 to Curtis Minogue and William Kottmeyer, Chicago; 5. No. 2,718,585 to Helmi Haru, Great Neck, N.Y.; 6. No. 2,722,974 to Everett Stegner, Colorado City, Tex.; 7. No. 2,705,468 to Sydney Dix, Los Angeles; 8. No. 2,696,017 to Lois Hall, Wichita, Kans.; 9. No. 2,714,783 to Neville Walker, Portland, Ore.*

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C. at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

Doctors Endorse This Comic



The crusading hero of "Rex Morgan, M.D." takes a one-two poke at a cancer quack and

Dr. Morgan's creator is a real M.D. with a lively practice and family

DR. NICK DALLIS writes comic-strip continuity amid such distractions as inspecting a new gap in daughter Carolyn's teeth and a new trick that her sister Sally has taught their dog Teena.

AT HIS OFFICE in Toledo, between calls by his patients, Dr. Dallis confers by long distance with his publisher in Chicago while scanning fan letters from followers of Rex Morgan.

Strip

the lay (non-doctor) coroner.

While some comics are blamed for inciting crime, "Rex Morgan, M.D." has won praise from the American Medical Association.

By Joseph Dorlaque

A YOUNG woman had her own special reason last fall when she asked for a job as a secretary in the office of the Publishers Syndicate in Chicago.

She said she had come there from her small-town home because she wanted to work for the company that put the comic strip called "Rex Morgan, M.D." in the newspapers. She felt grateful, she explained, because the Morgan strip had done so much to help her "back home."

For seven years she had had epileptic seizures with convulsions. Some of the home-town folks had acted as if they thought she was "possessed by the devil," she said. They avoided her and whispered.

This went on, she said, until Morgan in one of his comic-strip adventures explained that epilepsy is an illness and that with proper care epileptics can lead useful, happy lives. The strip gave people some understanding of her condition—they were friendly again and life became brighter.

She got the job in Chicago.

The epileptic episode is typical of the comic-strip dramatization which is winning Rex Morgan's author all sorts of official and unofficial praise.

A spare-time creation, Rex Morgan is written by a busy doctor—a real one—in Toledo, Ohio. He is Nicholas P. Dallis, M.D., who sometimes uses the pen name, "Dal Curtis." A psychiatrist, Dr. Dallis also writes another comic strip—Judge Parker.

Rex Morgan appears in about 300 newspapers which are read by nearly 100 million persons. Judge Parker is published in about 270 newspapers with a total readership of around 65 million.

Morgan appears as a young family doctor—a general practitioner—who has been known to run quacks out of town by exposing them before the right people. He also crusades against the dissemination of erroneous medical information by telling his patients—and anyone else who will listen—the truth about some diseases which are too often misunderstood. These have included—besides epilepsy—leprosy, alcoholism, multiple sclerosis, and mental troubles.

In 1954, the American Medical Association presented a special citation to Dr. Dallis for his work on the Morgan strip. The U. S. Food and Drug Administration, the American Cancer Society, and the President's Committee for Employment of the Physically

Handicapped have also joined in praising the doctor.

The AMA citation reads, in part: "He has contributed immensely to public education on many medical subjects and alerted Americans to the dangers of medical quackery."

Dr. Dallis has also won approval with his Judge Parker strip which deals mainly with the legal problems involved in mental illnesses. The American Bar Association has presented him with a citation. So has the Freedoms Foundation, which is an organization that gives awards for "outstanding contributions to the bringing about of a better understanding of the American way of life."

HUMANLY FALLIBLE, Dr. Morgan admits an embarrassing mistake.

One target of Morgan the crusader has been the "lay" county coroner, who is not a doctor. Most counties of 38 states of the United States allow a man to serve as the coroner of his county even though he may have had no medical or legal training or experience.

The job of the coroner is to find out why somebody died when crime or neglect may have been mixed up in the death. The inability of the lay, or untrained, coroner to diagnose some deaths makes murder easier to get away with. It also can let a dangerous epidemic get a head start on a community's health watchdogs, says Dr. Dallis. Rex Morgan's attack on the lay coroner in a comic-strip episode set off a fusillade of newspaper editorials here and there over the country.

This red-blooded physician of the funnies probably makes more "house calls" than any real doctor in the world. Besides the United States, his dramatic cases are read every day in the newspapers of Sweden, Germany, France, Belgium, Denmark, Trinidad, Norway, Japan, Okinawa, and several Latin American countries.

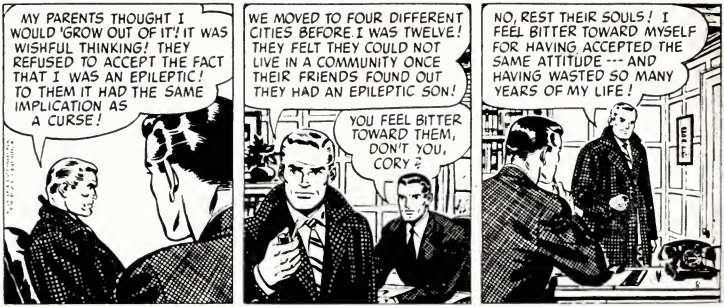
"We try to create the kind of doctor we think everybody would like for his own family," says Dr. Dallis. The "we" includes the other men who have a hand in the production of the Morgan strip. They are Marvin Bradley and Frank Edgington, who do the drawing, and Peter Klinefelter, who puts in the speech "bal-

[*Continued on page 280*]

Conference between Morgan

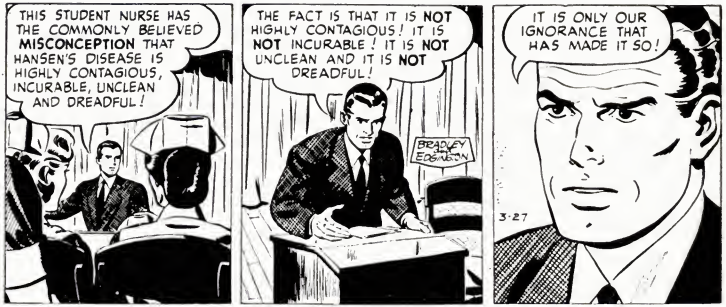
In this episode Dr. Morgan

Dread of leprosy, Morgan tells



and a patient helps to correct common misconception that epilepsy is something to be ashamed of.

points out that mental illness, like any other form of sickness, requires proper medical care.



class of student nurses, has been ignorantly exaggerated. He gives them (and readers) the facts.

New in Aviation

Hinged Wing A supersonic FSU-1 Crusader takes off with its variable wing in tilt-up position, and big leading-edge flaps down. The steep attack angle of the rear-hinged wing enables the Chance Vought jet to gain flight at a comparatively low speed after a short ground run. For high-speed

Curious Copter A four-rotor whirlybird is shown making its first test flight. It is the prototype of a big passenger Quadrotor helicopter (PSM, Feb. '56, p. 121), being developed by Convertawings, Inc. Speed and safety are claimed.

Jet Jitney Passengers may be carried from an airport terminal building to their jet airliner in this unique conveyance. It consists of a wheel-less bus pod that is picked up by a motorized straddle carrier. The driver, sitting in a cab on top, would drop a passenger pod at the plane, pick up an empty baggage pod, then head back for a third pod. Reason for the vehicle: to eliminate the high cost of taxiing jets to a convenient loading location.

flight, the wing is brought back to normal attitude. The two-position wing also makes possible low-speed carrier landings of the Navy's fastest fighter.

Back-Seat Flier A T-29 military transport is being flown by a pilot seated in the cockpit of an F-102 jet all-weather interceptor, which has been installed inside the cabin of the airliner. The pilot flies the big plane as if it were an interceptor, but here there's room for engineers and their equipment, and in-flight checks can be made on complex electronic control systems for advanced jet fighters.

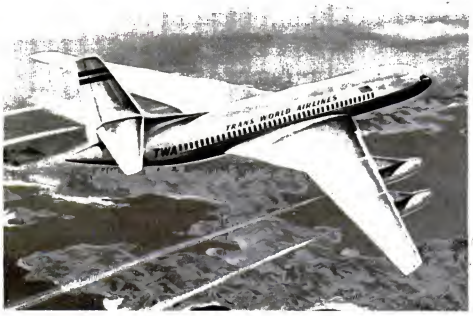
Homemade Bird Frenchman Roger Druine designed this small plane for the build-it-yourselfers. A single-seater, the Turbulent weighs only 342 pounds, is powered by a 36-hp. Volkswagen engine, and has a cruising speed of 75 m.p.h. Its takeoff speed is only 28 m.p.h. Cost is put at about $850, including Druine's plans. He claims that the little lightplane is so gentle and safe that it can be handled by a beginner with no solo experience.

For more picture news in aviation, please turn the page

New in Aviation

Bomb-Bay Capsule The Boeing B-52 Stratofortress strategic jet bomber can now double at other jobs—photo reconnaissance and special electronic missions. An auxiliary fuselage, or capsule (above), that fits into the bomb bay has stations for two crewmen and equipment, either aerial cameras or electronic gear and antennas. The capsule that turns the 650-mile-an-hour bomber into a multipurpose plane is shown being raised into place at left.

Jet Liner A cruising speed of 609 miles an hour is expected for this medium-range jet airliner, which will be built by Convair for delivery late in 1959. Powered by four new GE jet engines, the Golden Arrow will be able to get in and out of 5,000-foot runways, cruise at 35,000 feet. Exterior metal of the plane will be gold in color.



Spring Snare Lands Frogman On the Run

THE Navy is now putting the snatch on its frogmen. A slingshot-like retriever on a rescue craft travelling at 14 knots hauls them from the water in 2.4 seconds each.

Here's how the sea-rescue pickup works: A snare, on the end of a spring-loaded cord suspended over a towed rubber boat, is handed to a swimmer (top). The boat, moving away, stretches the cord like a rubber band (center). The stored-up energy then catapults him in (bottom). If other swimmers were to be picked up, a snare man would meanwhile have handed a second snare to another swimmer.

Experts of All American Engineering Co. plan to adapt it to 50-knot boats.

They Say Now . . .

ADMIRAL LEWIS L. STRAUSS, CHAIRMAN, ATOMIC ENERGY COMMISSION: *"We are not interested in . . . the most reactors to produce the largest number of kilowatts. . . . We are in the business of developing economically competitive nuclear power. . . . We do not know whether the Soviet goal is plutonium or . . . propaganda."*

DR. C. B. JOLLIFFE, VICE-PRESIDENT AND TECHNICAL DIRECTOR, RADIO CORPORATION OF AMERICA: *"The science fiction of today usually turns out to be the reality of tomorrow."*

DR. ROBERT W. CAIRNS, DIRECTOR OF RESEARCH, HERCULES POWDER CO.: *"Industrial chemical research . . . involves taking apart the bricks and mortar of nature's raw materials and rearranging . . . them into new molecular structures."*

DR. LOUIS T. BENEZET, PRESIDENT, COLORADO COLLEGE: *"Students in greater numbers come seeking careers in processing of men and materials . . . rather than careers dealing with the origins of knowledge. The course is easier and the career pays better."*

SENATOR JOHN F. KENNEDY (MASS.): *"If more politicians knew poetry, and more poets knew politics . . . the world would be a little better place to live."*

Inside Our First Big A-Power Plant

Here's a preview of the country's first large-scale nuclear generating plant, whose kilowatts will help light Pittsburgh's lamps and run its machines next year.

By Herbert Yahraes

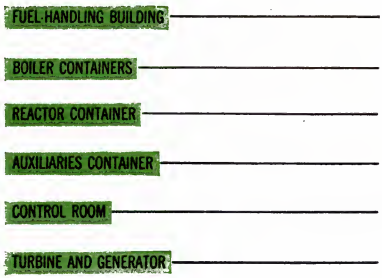
IN A vast, seven-story hole in the ground 43 miles west of Pittsburgh, massive sections of steel plate are being welded together to form gigantic cylinders.

Heavy pipes for carrying superhot radioactive water are being run between the cylinders.

Thousands of cubic yards of concrete are being poured to make five-foot walls around the cylinders.

These great steel vessels—the largest of them capable of holding three 10-room houses plus their lawns—will contain the vital organs of America's first full-scale atomic reactor for producing electric power.

Now rapidly taking shape on the left bank of the Ohio River at Shippingport, Pa., the structure of the plant is scheduled to be completed next spring. The nuclear core of the reactor is due to be ready in July, '57. Tests will probably take several months. Then one day engineers will throw the switch activating the control-rod mechanism. As the rods slowly rise from the plant's uranium-fueled furnace, a chain reaction will start, fissioning atoms will heat water, water will become steam, steam will run a turbine, and electricity will course into the lines of the Duquesne Light Co., which serves an 816-square-mile area including the city of Pittsburgh. Twelve years after Hiroshima, a full-scale electric utility plant using nuclear energy purely for power will be a reality.

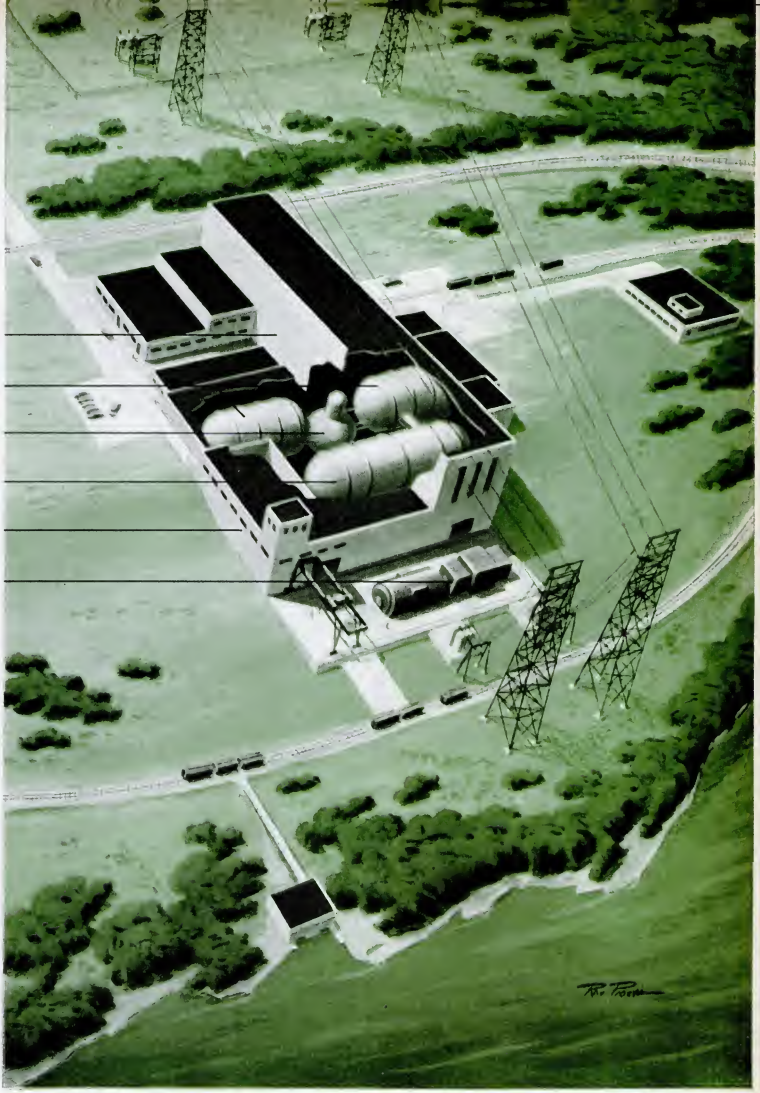


AERIAL VIEW of A-power station at Shippingport, Pa., is cut away to show huge vessels that hold nuclear reactor, steam boilers and auxiliary equipment. The steam turbine and generator will be on outdoor platform.

The first loading of uranium fuel, one pound of which equals 1,300 tons of coal, is expected to supply enough power to generate at least 60,000 kilowatts of electricity. That's enough for the homes of 250,000 people. More powerful nuclear cores, to be built later, will enable the turbine station to realize its full 100,000-kilowatt capacity.

Admiral Lewis L. Strauss, chairman of the Atomic Energy Commission, has called the Shippingport project "more fundamentally a pioneer venture than the first railroad to penetrate the West or the first airline to span the continent." It is also a complex mixture of governmental and private enterprise.

The Duquesne Light Co., which will operate the plant, is supplying the site



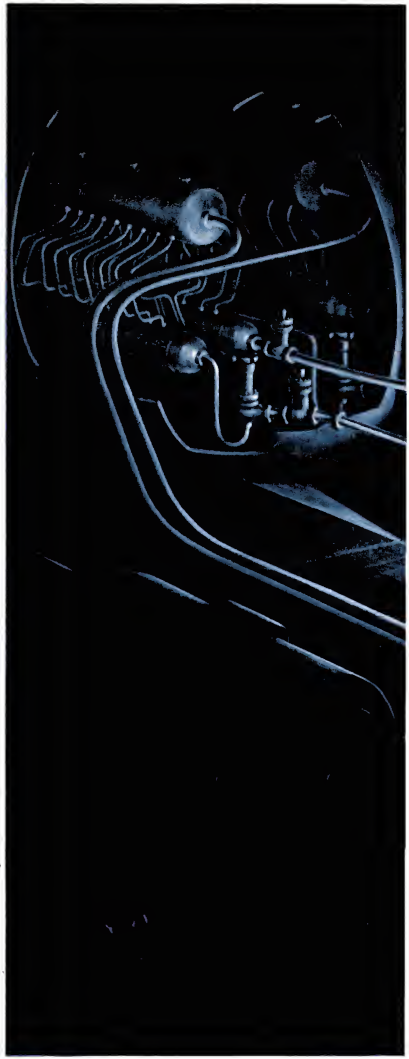
and building the turbine-generator section. Westinghouse Electric Corp. is building the nuclear part of the station under contract with the AEC and with the architectural and engineering assistance of Stone and Webster. Subcontractors include Combustion Engineering, Foster Wheeler, Babcock & Wilcox, Pittsburgh-Des Moines Steel, Burns and Roe, and Dravo Corp.

Total costs will probably run well beyond $100,000,000, more than half of which will be for research and development. Duquesne estimates that a plant of the same capacity, fueled by coal instead of uranium, could be built for less than $20,000,000. The difference—which represents the cost of pioneering—will shrink greatly for later installations.

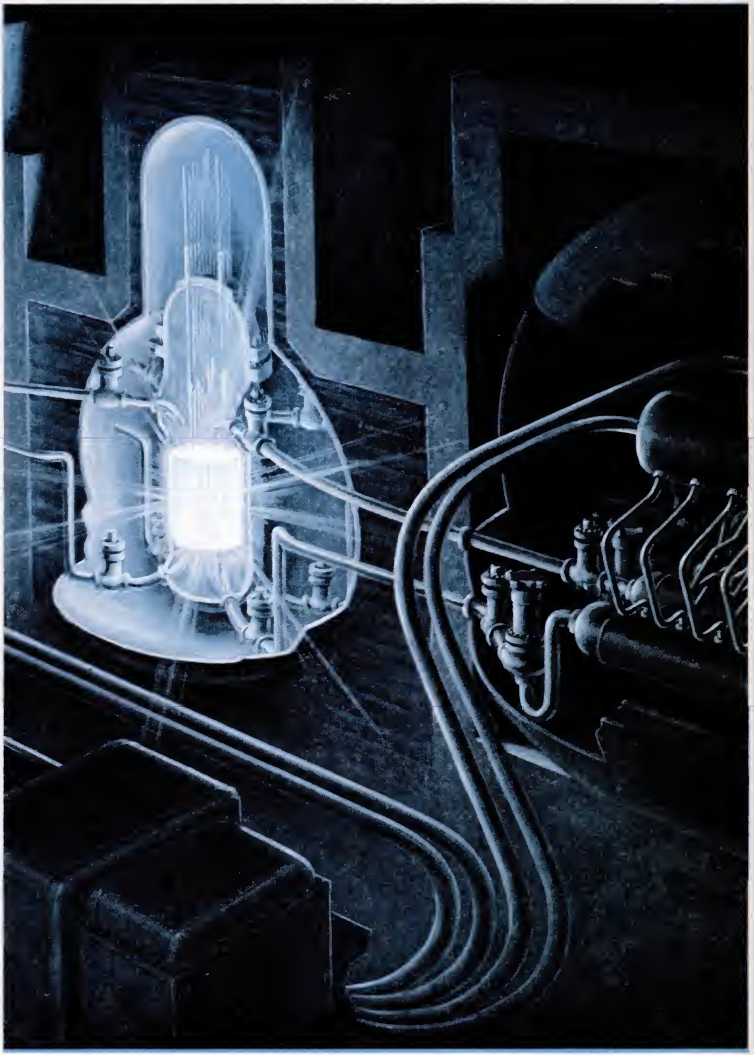
In this history-making station, electricity will be generated exactly as in any other steam-using power plant. The big difference lies inside four great, interconnected steel vessels that will contain the equipment for making the steam. One vessel holds the nuclear reactor; two more, the four steam boilers; and the fourth, auxiliary equipment.

The big containers are purely a safety feature. They are made of one-inch steel plates put together with thousands of feet of welding, every inch of it X-rayed to assure soundness. They cost more than $1,500,000 and they may be quite unnecessary, for every precaution has been taken against leakage anywhere. Nevertheless the designers have made the vessels big and strong enough to withstand the pressure if all the water in the reactor, under a pressure of 2,000 pounds to the square inch, tore loose at once.

When the station is in operation, no



URANIUM-FUELED REACTOR, heart of plant, heats pressurized water to 542 degrees. The water flows to boilers in adjacent vessels, gives up some of its heat to turn water of second circulating system to steam, and returns to reactor to be reheated. Steam of second system, piped from boilers, drives turbine and generator, then turns to water in condenser, whence feedwater is pumped back to boilers. Artist's conception departs from actual layout of plant to bring principal units together in this symbolic group.



one will be able to see its nuclear heart. But suppose you could. First you'd go through a five-foot concrete wall. That would bring you to a big steel ball 38 feet in diameter.

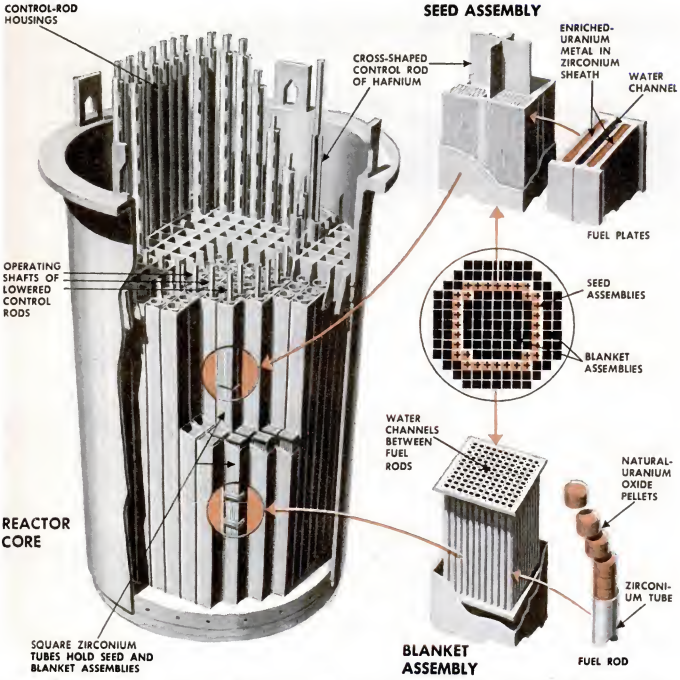
Inside the ball you'd find a wall of water three feet thick, and then the reactor vessel, standing as high as a three-story house and with walls of eight-inch steel.

.Finally, in the lower half of this vessel you'd come upon a stainless-steel cage, and this would hold what you were looking for. But if you've thought of uranium as chunks of metal, its appearance might come as something of a surprise to you.

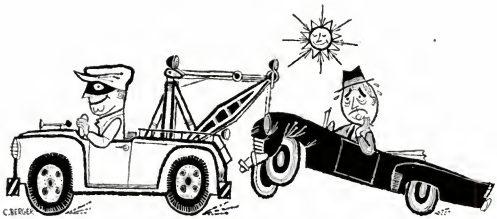
You don't just throw uranium into a reactor. You have to fashion it into the precise shapes and sizes calculated to support a chain reaction at the rate you want. That's expensive. The bill for the first nuclear core at Shippingport—containing some 14 tons of uranium—is going to be between $10,000,000 and $12,000,000, which makes it the most expensive load of fuel that was ever shoved into a furnace.

To get an idea of what it looks like, imagine a great armful of long square

[Continued on page 286]



CORE OF REACTOR, left, has two kinds of fuel elements, arranged in pattern shown at center right. Some have plates of enriched-uranium alloy. Cross-shaped control rods of hafnium metal pass between them. Other fuel elements hold stacked pellets of natural-uranium oxide.



How to Foil the Auto-Repair Crooks

Sure, the great majority of repairmen are honest. But the few who aren't can pick the unwary motorist cleaner than a cat can pick a fish. Here's how to protect yourself.

By John L. Springer

A HUNDRED miles from home, a car owner whammed his new sedan into a tree not long ago. After a tow truck had hauled the car off to a garage, the repair foreman studied the damage and prepared his estimate. The owner glumly initialed the estimate, the work was done, and the bill paid.

When the owner got his car back, he asked his regular mechanic to look the job over. A new oil pan, radiator, steering post, fender apron, wheel and other parts had supposedly been installed. But the mechanic found that not one replacement item was new. Everything was secondhand.

Steaming mad, the owner went to the local district attorney, and the D.A. investigated. The garage owner pointed to a line of small type on the estimate permitting him to use old parts if new ones weren't available. Now the motorist faces a drawn-out court fight to prove that new parts could have been bought, and to get back a $150 overcharge.

I HEARD that one from Edward Silver, Brooklyn's aggressive district attorney. Silver, who has been battling car-repair gyps in his county, has uncovered plenty of evidence that the cards are stacked against any owner who runs into a crooked repairman. Here's another typical case:

A motorist slid into a truck. A repairman verbally quoted $80 for the fix and the motorist told him to go ahead. When he came back to pick up his car, the mechanic announced that the bill had been increased to $140.

The motorist said he wouldn't pay. "Suit yourself," the repairman shrugged,

"I'll slap a mechanic's lien on your car. You won't be able to move it until I get my money."

THE mechanic was within the law. In most states, if you don't have a written estimate, you must pay what the mechanic says your bill is. And he can hold the car until you do. If you've been flagrantly overcharged, you can sue later and maybe get part of your money back.

I've asked law-enforcement officers, Better Business Bureaus, the American Automobile Association, and many garagemen about typical rackets that rook motorists. I found, of course, that the vast majority of mechanics and service-station men are completely honest. Said one AAA official:

"Our experience is that 99 percent of garages and service stations are trustworthy. But even one gyp outfit in a hundred adds up to a lot of dishonest places—because there are 100,000 auto-repair shops and 500,000 filling stations in the U.S. The average motorist probably runs into service-station crooks many times a year during his travels."

DRIVING across Illinois, a salesman realized that he hadn't changed oil for 5,000 miles. He pulled into a small-town gas station, ordered an oil change, and went down the street for lunch. At his next gas stop, more than 200 miles away, the attendant pulled the dipstick and commented on how dirty the oil looked. The first man had obviously spotted the out-of-state plates, pocketed the $3 for the oil he'd never delivered, and figured that the car would be far, far away before his chiseling would be discovered.

In upstate New York, a motorist pulled into a one-pump gas station behind two kids in a jalopy. The driver told the attendant to fill it up and left the car for the rest room. Hours later, well down the road, the driver got to thinking about the high gasoline bill he'd paid, particularly in relation to his gas-gauge needle. A little mental arithmetic showed him that the attendant had switched the hose without returning the meter to zero, and had thus added the cost of the kids' gas to his.

Some repair shops are set up so that they have almost an incentive system for gypping. In these places, the service manager and his mechanics work on a percentage. When a repairman tells you that you need a new part, you may have no way of knowing whether you really need the part, or whether he needs the commission.

Shops like these often find the costliest way of doing a repair job, bill you accordingly, and then use cheaper short cuts. This practice is so common that the America Fore Insurance Group uses a special school to teach its adjusters—the men who settle up on insurance claims—how to outwit bill-padding sharpshooters and keep damage-repair costs down to what they should be.

STUDENTS at this school are taught that there are usually at least two ways to repair a car. Say you slam into the rear of another car and your front grille is dented. A completely new grille may cost $43.50. But grilles come in as many as a dozen pieces that are easily fitted together. Maybe only a few sections of the grille need replacing. The sharpshooter bills you $43.50, changes the necessary pieces to make the grille look like new again, and pockets the difference.

The adjusters are taught to see what

Decoy Car Traps Crooked Garageman

To GET evidence, one district attorney used a new twist on an old trick. He took a well-worn sedan and had it worked over by police mechanics until the car was in perfect condition. Then he had a detective drive it straight to a garage suspected of gypping the public. As expected, the sharpy mechanic there insisted that the car was in bad shape, and that it needed at least a new fuel pump, carburetor, fuel filter and several other parts, plus expensive labor.

The crooked mechanic found himself in court.

7 Ways to Guard Against Auto-Repair Gyps

1 You're better off buying all your gas and oil from one place—the operator has a stake in your good will and won't jeopardize it by trying to pick up a few doubtful dollars.

2 If you get into a jam on the road and must have your car towed away, try to find out the reputation of the repair shop you're sending it to. Once a disreputable shop gets your car, it may quote an out-of-line price for repairs, figuring that you're over a barrel.

3 Always get an estimate in writing on major repair jobs, and make it plain that you don't want any work done without your specific approval. Read it carefully for hidden jokers. On ordinary parts replacements, you can check on the price quoted you by consulting the manufacturer's standard-rate manual, available at authorized dealers. It lists what each part costs and how long it takes to install.

4 Show interest in repair work being done. Don't just say, "My car won't run. Can you fix it in a hurry?" If you ask a few intelligent questions, the repairman will size you up as a risky person to gyp.

5 If parts need replacing, tell the repairman beforehand that you want the old parts. On fuel pumps, generators, starters, carburetors, tires, batteries, and voltage regulators, you are generally entitled to an allowance on the old unit that is replaced. Insist upon it. Also, insist on new or *factory*-rebuilt parts.

6 If you are traveling, make sure that you get all the gas and oil that you pay for. Some servicemen think it's perfectly okay to gyp strangers.

7 There is some protection in belonging to an automobile club, and in dealing with garages affiliated with that club. The club contract is valuable to a garage and no garage owner wants to lose it. He knows that complaints can cost him his contract. He'll think twice before trying to put anything over on you.

can be salvaged before approving a bill for new parts. For example, in some cars with automatic transmissions, the oil that operates the drive is cooled by a separate radiator segment in the bottom of the cooling system. This unit alone costs $12. Even if the main radiator tank is ruined, this segment often can be saved. Or possibly only the core section is damaged. An honest serviceman will replace the core only—at a saving to you of maybe 30 percent.

Suppose your hood is damaged on one side only. On most cars, hoods are made in two sections and welded together. You could save one half and weld it to a new half. A mechanic who tries to bill you for a completely new hood stands to pocket an extra $25 or $30 on the job.

REPUTABLE garagemen trying to run an honest business told me that some customers practically demand to be gypped. These customers want every repair made quicker than is required to do a good job. Then the serviceman is forced to cut corners if he wants to keep his trade.

"Many customers can't or won't spare cars for the time needed for a good job," a repairman told me. "They're on us from morning to night, demanding their autos. Pressure like that makes you push repairs without double-checking. Some jobs we turn out under such circumstances are pretty sour. But what else can we do when customers think that the worst crime of all is not to have the car ready when they want it?"

SOME car owners who think they are being gypped often are actually the victims of a serviceman's ignorance. The newer your car, the surer you had better be that your repairman knows his business. Say you buy a new model car with a radically different transmission gimmick. For about a year, only the car's authorized service stations will be likely to know much about repairing that transmission. Take your car elsewhere, and you may pay a day's wages to a repairman while he tries to find out what it's all about.

How can you protect yourself from the gyps? Complete protection is just about impossible, unless you know everything there is to know about automobiles and you have time to stand over a mechanic, checking every move. But the experts say that the precautions listed on this page will *tend* to get you a square deal. END

New Aids to Living

1 Kitchen corner is no problem when Rota-Drawer units are fitted into the angle. Pie-shaped steel drawers hung on a vertical rod swing out at the touch of a finger into full view.

2 Play-Shade and totem tent fastens to a clothesline pole or a post to cast a 50-foot square of shade. The folding umbrella can be fixed at any height or tilted at any angle to block out sun. Sidewalls convert it to a playhouse, camp shelter or beach cabaña.

3 Triple-threat tool lets you rake, hoe or dig weeds with one implement. Pushing down rod on handle closes tines, positions hoe and digger.

4 House marker less than an inch thick lights up inside. The bulb housing at one end of the plastic name plate screws to a window- or door-frame. The wire passes through a drilled hole to plug into an indoor outlet.

5 Miniature vacuum cleaner keeps you looking as spruce as a West Pointer and does a quick job on furniture and car upholstery, too. Two flashlight batteries keep a little centrifugal blower spinning to draw in dust and lint.

6 Duster spray treats cloths and mops to make dust cling instead of scattering to new quarters. The gathered dust rolls up into big, lint-like globules that are easy to shake free over a wastebasket or a spread newspaper.

7 Breeze control makes any fan—or any air conditioner up to ¾ tons—automatic. Just plug in the appliance and the palm-size unit recognizes temperature changes of plus or minus one degree, feeding in or cutting off the current to cool or warm up the room.

8 Built-in vacuum cleaner puts the motor in the basement, attic or garage (right). Hose and attachments plug into an inlet valve in each room and dust is sucked into a container beneath the husky one-hp. power pack. You can even vacuum wet surfaces with the Vacu-Flo.

More information *about the products shown on these pages can be obtained from: 1. Home Steel Products, Inc., 1528 Vassar Ave., N.W., Canton, Ohio; 2. The Play-Shade Co., 111 S. 13th St., Garland, Tex.; 3. Dandy Products Corp., 220 Nat'l Bank Bldg., Oshkosh, Wis.; 4. Fineline Co., 303 Fifth Ave., New York City 16; 5. Morton's, 312 7th St. N.W., Washington 4, D.C.; 6. Fuller Brush Co., 3586 Main St., Hartford 2, Conn.; 7. C & M Industries, Inc., 141 E. 44th St., New York City; 8. Vacu-Flo Division, H-P Products, Inc., Louisville, Ohio.*

"Watch her, Gus," Whipple warned. "She may be riding the brakes on the sly."

Gus Defends a Woman Driver

By Martin Bunn

GUS Wilson, genial proprietor of the Model Garage, found himself drawn into the touchy argument about the comparative driving ability of men and women when Mr. and Mrs. Henry Whipple came to him. Henry Whipple, a portly, excitable man with piercing eyes behind thick glasses, slipped out of the family sedan to start the ball rolling. Frieda Whipple, pretty and plump, sat in the car and regarded her husband with an air of disdain.

"Gus," Whipple pleaded, "will you please check over this car and convince my wife that there's nothing wrong with it?"

"Don't ask the man to perform miracles," Mrs. Whipple said. "There's something wrong with it and you know it. The trouble with you, Henry, is that you're just too stubborn to admit it."

"Women!" Whipple groaned, clapping

his forehead in disgust. "Gus, I drive this car every day and it runs like a watch. She drives it at night and has all kinds of trouble. But will she admit it's her driving? No, it's the car. Or maybe the night air or the heat of the moon that makes it get hot."

"Do you mean to tell me," Gus asked, "that this car heats up at night, and doesn't in the heat of the day?"

"Exactly," Whipple said triumphantly. "And not only that, it loses power, won't pull the hat off your head, and gets poor gas mileage—that is, according to my wife's story. Probably she drives with the parking brake on or rides the foot brake."

"I do not," Mrs. Whipple declared. "Mr. Wilson, please prove to my husband that there is something wrong with this car."

Gus glanced at his helper, Stan Hicks, who stood a few feet away, and showed both elaborate unconcern and suspiciously shaking shoulders.

ASSUMING his best professional attitude, Gus said, "I'll do my best. Now if you'll just give me some of the details."

"I drive the car every day on my job," Whipple said firmly. "I work for Roberts Brothers selling dairy machinery, milking machines, everything for contented cows—that's our motto."

"How could a cow possibly be contented with you in the barn, Henry?" Mrs. Whipple giggled.

"Don't interrupt, my dear," Whipple said. "Now, Gus, I drive this car every day over rough country roads, up hill and down, calling on dairymen, and it runs fine. I get home around five. Then, about seven-thirty, three nights a week, my wife drives it to Stanfield, where she teaches a night class in home economics. She has all kinds of trouble. You know, Gus, that it could be nothing but her driving."

"Gus knows nothing of the kind," Mrs. Whipple said heatedly. "I've been driv-

ing since I was a girl, and I've never had anything like this."

AT THIS juncture, Gus wisely took refuge under the hood. He felt that it was Mrs. Whipple who would most likely be put out, since it seemed impossible for a car to heat up in the cool night air and run cool in the heat of the day, unless the driver was at fault.

Perhaps Frieda Whipple had been driving with the parking brake on. But it seemed to be unworn, and there was no drag from either the parking or service brakes in the released position.

Methodically Gus went over the car, checking ignition, timing, carburetion, gas pump, compression and cooling system. As he worked it occurred to him that even if he did find something wrong it wouldn't solve anything. The problem here wasn't whether there was or wasn't a flaw in the car. The problem was, what could be wrong with a car that would cause the difficulties Mrs. Whipple reported, at night, with the same car performing perfectly in the daytime? Or was Henry Whipple playing a game with her by claiming that he wasn't having the same troubles with the car that she was?

"The brake! Put the brake on!"

PUTTING this night-and-day business from his mind, Gus concentrated on what would normally cause a car, day *or* night, to lose power, get poor mileage, heat up. His thoughts turned to the manifold heat valve and he checked it. The counterweight showed that the valve in the cross-over pipe was open, as it should be with a warm engine.

"This engine feels warm," he said to Whipple, knowing that the couple only lived a few blocks distant. "How far has it just been driven?"

"We came right over when I got home from my route," Whipple told him. "Didn't even stop to eat. I wanted to settle this thing once and for all before my wife drove to Stanfield tonight. You'll notice that the temperature gauge is normal. So you see, it must be my wife's driving."

"Don't put words in Gus's mouth," Mrs. Whipple said.

"I'm sorry, Mrs. Whipple," Gus said apologetically, "but your car seems to be in excellent condition—so far, I haven't found anything wrong."

"You see, my dear," Whipple said, triumphantly snatching off and polishing his glasses, "I'm right. Now perhaps if you would take some driving lessons . . ."

"Just a minute," Gus said, holding up a protesting hand. "I didn't say your car was in fine shape. I said, it *seemed* to be. I think that the thing to do is for you two to go home and have your dinner. Then, at the usual time, Mr. Whipple and I will ride to Stanfield with you. Stan Hicks will follow in my car, to bring us back while you attend your class."

Mrs. Whipple beamed. "Mr. Wilson," she said, "you are the nicest man. That's just what I've been trying to get Henry to do."

Stan Hicks chuckled after the couple had gone. "Gus, it looks like you've let yourself in for a hectic evening. I'll drive far enough behind so that I won't get hit by flying objects."

GUS and Stan found the couple waiting and eager to go when they drove up to their home at seven-thirty. Mrs. Whipple took the wheel, Gus beside her, Whipple in the back seat. Gus noted that the engine had cooled off and the heat-gauge needle was down on the pin. The motor ran sweetly.

[Continued on page 240]

HALF-BARREL GUN (left) uses cartridges with plastic tips. Combination gun (right) takes either cellophane-wrapped "loads" or bulk compound.

The Gun That Protects Your Home

It squirts calking compound to keep out water and cold air.

YOU can't beat a calking gun for home defense. Once you've triggered one of these hand tools you'll find it as indispensable as a hammer or a handsaw. Better yet, it's fun to use. It works like Junior's water pistol, but the similarity ends there.

A calking gun fights back at water. Correctly handled, it does a thorough job of squeezing mastic compounds into the troublesome cracks that develop, season after season, even in the best-built homes. Whatever the weatherproofing or sealing job, a calking gun does it the neat, professional way.

A calking gun that you can buy for a

TO LOAD BULK CALKING into a combination gun, take off the cap and draw the plunger back.

TO USE CARTRIDGES in a combination gun, remove the leather washer from the plunger.

few dollars will give you a lifetime of service and pay for itself many times over. You have three types to choose from—half-barrel, combination and pressure guns.

Half-barrel guns. A popular homeowner model is the little half-barrel gun, so named because its body is shaped like a semi-circular trough, with a fully cylindrical cap at each end. The forward cap may have a tip attachment. If it doesn't, there will be an opening at the center of the cap. You buy compound either in metal or heavy cardboard cartridges.

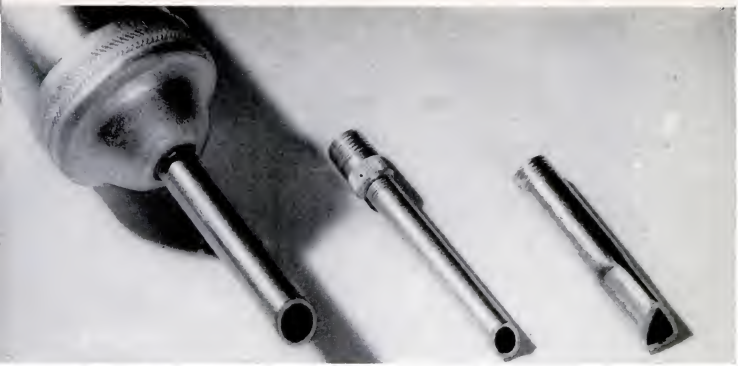
A tipless gun uses a cartridge that has its own built-in plastic tip. To operate the gun you lay the cartridge in the half-barrel with the tip projecting through the cap opening. Then you press the gun's plunger firmly against the bottom of the cartridge and puncture the seal in the tip. When you trigger the gun you're in business. The trigger ratchets the plunger forward, forcing the bottom of the cartridge into the cylinder like a piston. A smooth ribbon of compound feeds out through the tip.

For a half-barrel gun that has its own tip attachment, you can use the same type of cartridge by cutting off the container's plastic tip. Tipless cartridges are also sold for this type of gun at many hardware and paint-supply stores.

The advantages of the half-barrel gun are its low cost (around $2.50) and, in the case of the tipless type, the fact that the gun never has to be cleaned unless a cartridge ruptures. Guns with tip attachments need a bit of cleaning each time a cartridge is removed. Offsetting this disadvantage, the gun with a tip attachment takes a variety of specially shaped nozzles for unusual calking, glazing and seaming jobs.

Combination guns. Favorite of some homeowners and most professionals is the combination gun, costing from $4 up. This is a full-barreled job that can handle either bulk compound or flexible cellophane cartridges ("loads"). Although it uses the same triggering mechanism as the half-barrel gun, it must have a leather piston washer attached to the face of the plunger. This washer creates a sliding air seal. To load the gun with bulk compound you remove the forward barrel cap, dunk the open end of the barrel in the compound and draw the plunger rod back.

To release the plunger ratchet from the trigger for loading, or to stop the flow of compound through the tip, some guns have a rotating plunger rod. A half turn disengages the ratchet teeth. On



METAL TIPS for doing various calking, glazing and seaming jobs may be bought separately or in kits of the more popular shapes and sizes. Or you can adapt a cartridge's plastic tip.

other guns, letting the trigger snap back frees the ratchet. Still a third type has a release lever on the handle.

The combination gun is both versatile (you can load it with certain types of compounds that can't be bought in cartridges) and economical, especially on big calking jobs. Bulk compound costs about 12 cents less per gun load than a cartridge. That's why professionals go for combination guns. As a homeowner, however, you may find that the ease and cleanliness of handling cartridges more than make up for the extra dollar or so you'll spend on an occasional calking job.

Pressure guns. Unless you own a paint-spray compressor and have an unusually large amount of calking to do, you can write off this type. Its cost is low (about $8), but it is strictly a production tool. It uses either cartridges or bulk compound, forcing the material out of the tip by backing the plunger with compressed air. A touch of a thumb controls air flow to the rear of the barrel.

Special tips. If your gun has a tip

TO USE A GUN, incline it at about a 50-degree angle, letting the tip straddle the crack. Move the gun along steadily while feeding the compound with an even pressure on the trigger.

LEAVE THE BEAD ROUND after it is in place. Never flatten it. The heavier the bead, the greater its durability. And be sure to fill the crack to the bottom. Don't just cover it.

Four places where you can use a calking gun

AROUND DOORS. A single cartridge usually contains enough compound to calk a door frame.

ON ROOFS for minor repairs. For this type of job, load your gun with asphalt-base calking.

attachment it will probably come with a standard ⅜″ oval nozzle—the most useful type for ordinary calking. For special jobs you can buy extra tips with openings that range from ⅛″ to 2¼″. The openings may be round, oval, flat or triangular. A good bet is an assortment of four tips in a kit that sells for around $1.25. With one of these kits, you can handle practically any home calking job you're likely to run into.

Even with plastic-tipped cartridges, you can vary the shape and volume of a calking bead to some extent by applying more or less side pressure to the flexible plastic nozzle as you trigger the gun. Better yet, soften the tip by soaking it in hot water, then model the plastic to the desired shape. When it cools, it will retain the form.

Choosing the right compound. Your choice of compound can make the difference between a good job and a bad one. Low-grade compound may be lumpy. It may not bond properly. It may also shrink, harden, crack or stain excessively. If the compound is packaged in inferior cartridges, they may break open at the seams. A low-grade cartridge often calls for excessive triggering pressure to produce a flow. When this happens, it is generally because the cartridge has not been lined with wax to make the compound ooze out easily. Top-grade compound is almost always labeled: "Meets Government Specifications."

Choose the right type for a particular job, too. When you walk into a paint store and say, "I want a cartridge of calking compound," chances are you'll get a cylinder of brown-gray goop. That's fine if you plan to paint over it afterward. But if you are doing an inside job around the edges of white tile, you can save a lot of extra fuss by asking the salesman for "pure white" or "brilliant white" compound.

Asphalt calking. For exterior work that calls for a particularly durable and elastic compound, your best bet may be asphalt. Although it will adhere to any surface, wet or dry, its surface loses its tackiness after it is applied. Asphalt calking is especially useful for repairing small roof leaks and for sealing flashing around chimneys, skylights, gutters and the like. If you plant to paint over asphalt calking compound, ask for the "nonbleeding" type.

Suppose you want a batch of compound of a particular shade or color to match adjacent surfaces. You can't buy this tinted compound in cartridges, but if you have a gun that takes bulk compound you can mix your own color blend. A half-pint of coloring solution—pigment ground in oil—is about the right amount for a gallon of compound. After you have added the color—there's usually room for it in the top of a gallon can of compound—close the lid tightly and have your paint supplier put the can in his mechanical shaker for a two-minute session.

AROUND WINDOWS. Calk those in basement on all four sides, both inside and outside house.

AROUND TUBS. Because compound may attack plastic tile, protect it with masking tape.

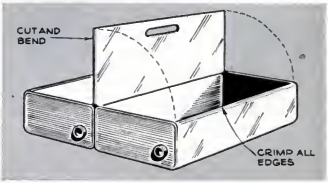
How to use a calking gun. Use as much care in preparing surfaces for calking as you do for a good paint job. Remove all loose material—chipped masonry, rotted wood, peeling paint, etc. If you are calking over wood, make sure that it is dry. Do not calk if the weather is damp or the temperature is below 40 degrees. To make calking easier to trigger on cool days, warm it before loading the gun. For the best bond, swab the area to be calked with a rag moistened with turpentine or mineral spirits.

To fill a crack, incline the gun at about a 50-degree angle. The tip should straddle the crack so that the calking is applied equally on both sides of it. Be sure to *fill* the crack—don't just cover it. Also, once you've laid down a bead don't flatten it; its surface should always be convex. When you calk an opening that is wider than ⅜″ or deeper than ½″, pack the area with oakum, rope, mineral wool, plaster, wood or felt before applying compound.

Once you get the knack of handling the gun, you'll find that you can calk a whopping 10′ crack in under 30 seconds. To estimate the amount of compound you'll need for a particular job, figure on from 20′ to 22′ of cracks per standard-size cartridge or gun load. END

Acetone Cleans Tin-Can Stock

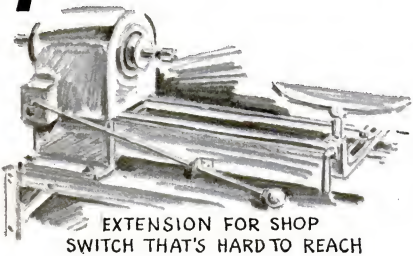
MOTOR-OIL and antifreeze containers, especially the 10-quart size, provide large pieces of useful sheet metal for many projects. You can clean off printing, dirt and grease with acetone, or nail-polish remover, rubbed briskly with fine steel wool. No further treatment is needed before soldering or finishing.



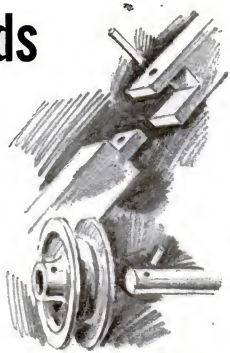
Oil Cans Tote Tools to the Job

Two large oil tins make a good tray for carrying tools. Cut open the side of each can as shown, bend up the resulting flaps and crimp them together. An oblong hole cut in the joined sides forms a carrying handle. Crimp and file smooth this edge, too, to keep it from cutting your hands when you grip it.

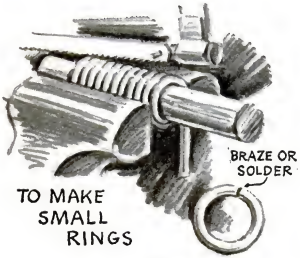
7 USES FOR Welding Rods



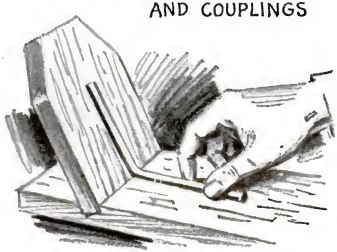
EXTENSION FOR SHOP SWITCH THAT'S HARD TO REACH



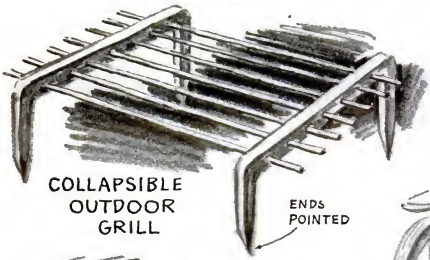
PINS FOR PULLEYS AND COUPLINGS



TO MAKE SMALL RINGS

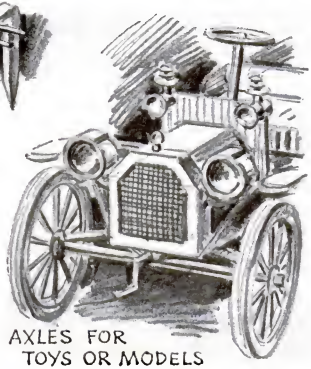


FOR DUPLICATING ANGLES



COLLAPSIBLE OUTDOOR GRILL

RIVETING



AXLES FOR TOYS OR MODELS

New for the Handyman

1. You Get a Free Trowel. A new repair and resurfacing material remains pliable for two hours, making it easy for you to get a professional finish or mold a corner or other contour. It is a special-blend powder that is mixed—in any quantity, from a thimbleful up—with liquid rubber latex instead of water. Used for all masonry surfaces, including concrete, brick and stone, it adheres also to wood, metal, slate and glass. A kit contains 10 pounds of the powder, a quart of latex and a free trowel to do the job.

2. Tool Repairs Faucets. When a new washer doesn't stop drip, you can reseat the faucet with this abrasive tool. A collar aligns it in the fixture. The tool comes with backing plates and waterproof abrasive disks for ¼", ⅜" and ½" sizes. Available with it in a kit or separately are ball-bearing, nylon-capped washers said to be long wearing.

3. Tripod Level. Here is a new type of low-cost transit that is basically a spirit level equipped with sights and mounted on an adjustable tripod. It will give accurate readings for leveling a wall, foundation, or other project. With the level off its mount, you can fold the tripod to fit your toolbox.

Please turn the page for more handyman tips

More Handyman Tips

4. Paintbrush Cleaner Is Re-usable. Work a brush or roller in this emulsifier and you can rinse the paint out under tap water. Paint particles do not dissolve, but settle in the liquid, which can be poured off for re-use. The liquid will clean a surface for painting, take paint off hands, or seal paint left in a can.

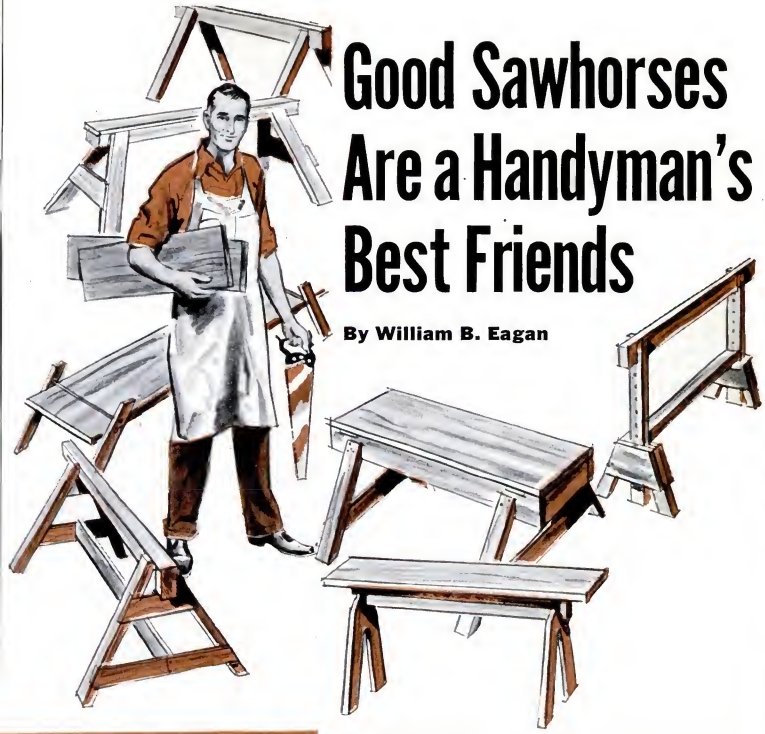
5. Metal Tape Trims Corners. Straightening the joint between a ceiling and wallboard, or finishing an inside or outside corner, is made simpler by this trim which consists of two metal strips mounted on heavy paper. It comes in 100′ rolls. You cut off the needed length and apply it with wallboard joint cement.

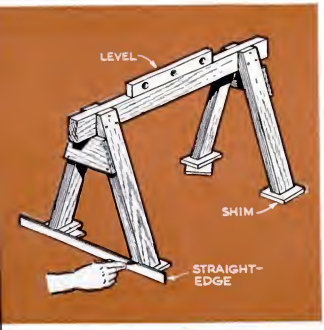
6. Mother-of-Pearl Put in Wall Panels. Iridescent walls, like those in the powder room of the palace in Monaco and the lobbies of sumptuous Miami Beach, Hollywood and New York hotels, are now being made in 4′-by-8′ panels. You can nail them up yourself for about $6 a square foot. Two steps in the manufacture are shown above: at left, prepared ocean-pearl shells being coated with adhesive and placed on a backing, and at right, a sheet being slid into a press to make the bond permanent before burnishing. Panels come flat or curved.

More information *about the products on these pages can be obtained from: 1. Latex Concrete Co., 10 W. 70th St., Chicago; 2. Ardmore Products Co., Conshohocken, Pa.; 3. Treo Corp., Colchester, Ill.; 4. Rinn Products, 2929 N. Crawford Ave., Chicago 41; 5. Steel Corner Tape Co., 121-07 133rd St., S. Ozone Park. N.Y.; 6. Kappa-Shell Products, Inc., 121 W. 17th St., NYC 11.*

Good Sawhorses Are a Handyman's Best Friends

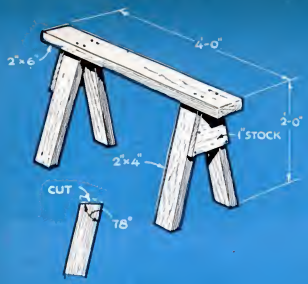
By William B. Eagan



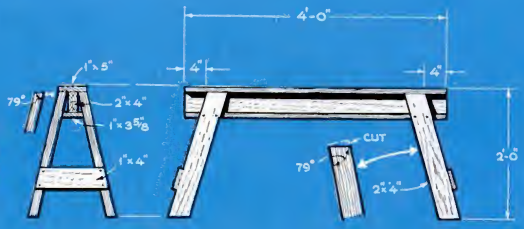


SAWHORSES are good for more than sawing. You need them for a portable workbench, a scaffold to stand on while you paint, even a seesaw for the kids or a bench for a picnic. Good, solid ones are easy to make, and you can often use scrap pieces of lumber.

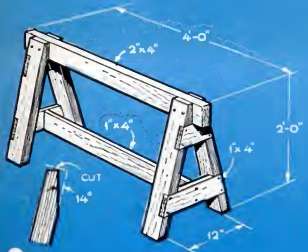
The only construction step that might puzzle you is cutting the leg ends. The angles for the tops of the legs, where they join the rail, are marked on the drawings. To get the bottoms angled so that the horse stands flat on the floor, cut them after the horse is assembled. Place a level on the rail and shim each leg with thin wood until the level bubble is centered. Then set a straightedge on the floor alongside the legs and mark them for cutting. On the two following pages are plans for nine sawhorses.



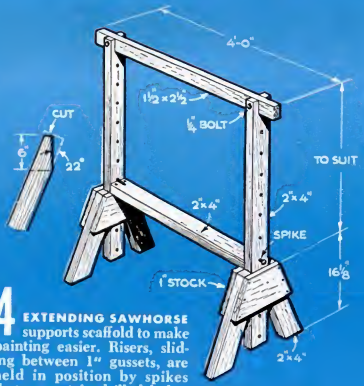
1 **SIMPLE AND EASY TO BUILD,** this horse is one of the most popular. Rough use, however, may eventually cause the rail to work loose.



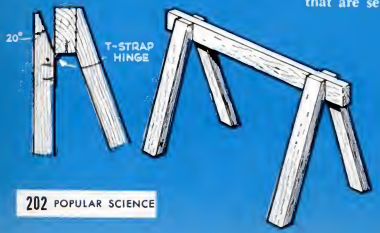
2 **STURDIER TYPE** has I-beam rail built up from two 1" boards and 2"-by-4". The splayed legs make it a steady horse to use.



3 **REALLY RUGGED** for hard work, sawhorse above uses 2"-by-4" legs and rail. It is heavily braced with set-in sidepieces, extra rail.

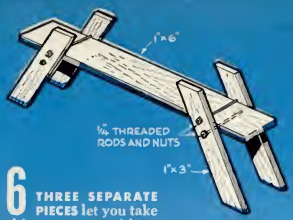


4 **EXTENDING SAWHORSE** supports scaffold to make painting easier. Risers, sliding between 1" gussets, are held in position by spikes that are set in drilled holes.

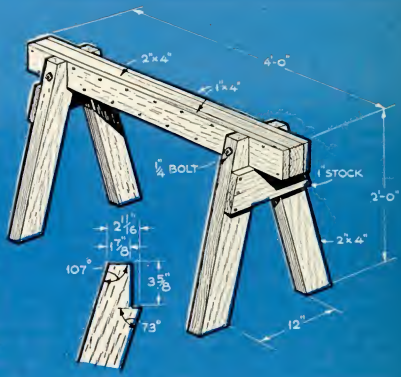


5 **HINGED HORSE** folds flat when you lift it so that it is easy to store and to carry through doorways. This variety is best suited to light work.

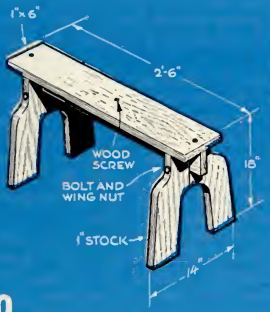
How to Make the 9 Most-Wanted Sawhorses



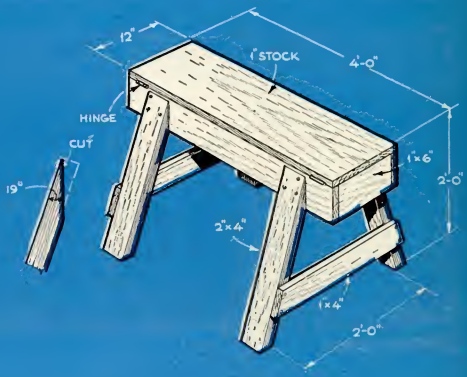
6 **THREE SEPARATE PIECES** let you take this one apart without removing any nuts. Weight pressing down on the board holds it together in use.



7 **STURDY KNOCKDOWN MODEL** has legs that slide into built-up notches in the rail. Long bolts hold the legs firmly in position.



8 **BENCH HORSE** looks good enough to serve in living quarters, but is really a fancy knockdown type. Each leg is made of two curved sections.



9 **TOOL-CARRYING** horse is a carpenter's favorite. It is a simple box with hinged lid and sturdy legs. A shelf may be added across the braces.

Twin Bikes Carry the Whole Family

THE cost of gasoline means nothing at all to Mr. and Mrs. James H. Weeks of Ames, Iowa. They don't need a drop. They and their youngsters travel on a bicycle-built-for-four.

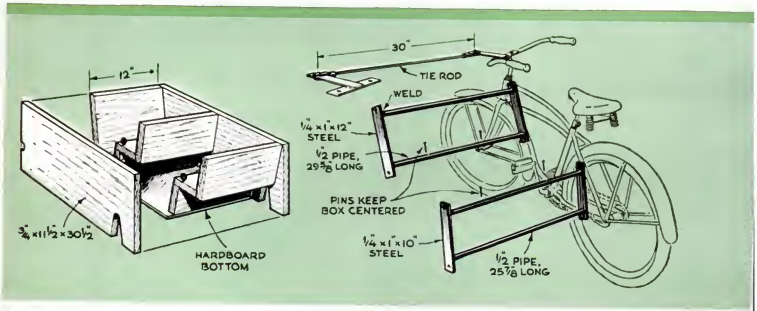
The family conveyance is the handiwork of Jim Weeks himself. He bought the first bike to ride to class at Iowa State College. This was a good deal. So he bought another for his wife. Then came the idea of bolting the two bikes together and putting seats between for daughter Kristan and son John.

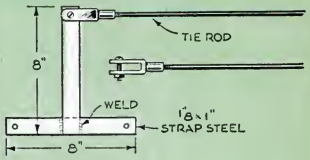
The rig is safe and sturdy, yet handles easily enough for one person to ride. When the kids aren't along, the two-seater box in the middle can be slipped out or used as a shopping carrier.

The two bikes have identical frames. They were fastened together with cross braces made of iron pipe welded to ¼" strap-steel end plates. The end plates were bolted to each bike's tubular frame. The front cross brace was made up first, bolted on, and the bikes then set parallel and measured for the rear brace. This is a few inches shorter than the front brace because it bolts to the wider rear-wheel forks.

T-shaped extension arms bolted to each handle bar are linked together by a tie rod so that the front wheels turn together. The tie rod is an old auto brake rod that had a threaded fork connector on one end. By varying the fork's position, the rod's length can be adjusted for perfect wheel alignment.

The two-seater baby buggy was built from pine one-by-twelves with a hardboard bottom. Notches in the front end hook into the forward crossbar, while slots near the back drop over the rear crossbar. This locks the box securely in, yet allows it to lift out without unbolting.





STEERING ARM, made by welding 1/8" steel strap into T shape, is bolted to center of each handle bar. Tips of arms are linked with tie rod so that wheels turn together.

You can learn something useful about television, and maybe about people, from these

Domestic Troubles of a TV Repairman

By Art Margolis

REPAIRING a TV set can mean patching up a spot of domestic trouble at the same time. Innocently coming to doctor a chassis, the serviceman may find himself involved in a family crisis.

I ought to know, for my own jobs have brought me up against domestic-relations cases ranging all the way from a whining dog to a wife who threatened to plaster hubby with a pizza pie. I even ran into a problem like this in my own home.

Like people and icebergs, electron tubes live seven-eighths of their lives beneath the surface of things. Tubes may light and seem to be working hard, while actually goldbricking on the job. That was the trouble in four service calls that turned out to involve human as well as TV troubles. Take, for instance:

The Case of the Stay-at-Home Housewife and the Disappearing Diode

SOMETHING besides a nonfunctioning TV set was bothering the pretty young housewife who let me in one morning. But her other troubles were none of my business—I thought. The 17-inch picture showed four-sided shrinking when I turned it on. After a few seconds it blacked out.

Diagnosis was a cinch. Inside the brightly lit 5U4 rectifier tube was a bluish glow that plainly said "guilty." This tube was a diode, which is the simplest kind

The boss's wife was hefting a big pizza pie as if trying for good aim. "You tune it that way on purpose," she shrieked, "so I won't see my candidate."

of electron tube. It has only two elements. One is the cathode, which may be the filament itself, or a sleeve heated by the filament. Coated with thorium, it shoots out a stream of electrons.

The other element is the plate, which cannot emit electrons but makes a fine target for those coming from the cathode. That stream of electrons constitutes an electrical current.

The function of a rectifier tube is to change alternating current from the house line into direct current for use in the TV circuits. On that half of the AC wave during which the electron-emitting cathode is negative, the electron stream carries current to the plate. But on the other half of the wave, when the non-emitting plate is negative, the electrons crowded there cannot get off and no current passes. Since only half the AC gets through, it becomes direct current.

Not all the electrons from the cathode reach the plate; some float around, creating what is known as a "space charge." They also get in the way of the electron stream, keeping some of it from the plate. But the tube is designed to deliver

enough juice even with such a handicap.

The vacuum of this 5U4, however, had been invaded by some exterior gases, which absorbed the space charge. With this out of the way, the full electron stream was hitting the plate. For a time the tube carried more current than it was ever meant to. Then the overload took its toll, the damaged tube could no longer deliver a strong DC supply, and the starved picture circuits blacked out.

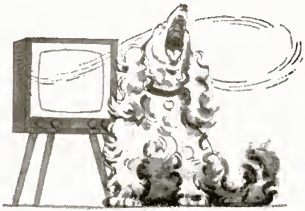
When I changed the rectifier tube, the picture burst on bright and crisp. I left it that way, only to get a call from the same customer the next day.

There was an empty socket where I had installed the new 5U4. Asking no questions, I put in another.

The third morning I was called again. On looking into the set, I began to wonder. That 5U4 socket was empty again!

"Who's been eating the tubes?" I asked the young housewife.

With downcast eyes she sheepishly answered. "My husband thinks I neglect housework to look at TV. Every morning he takes the tube to work with him."



The Tweeter Bothered the Woofer

"ROVER just can't stand our television set," the woman on the phone said. "Every time we turn it on, he moans."

The 21-incher seemed to be working perfectly. But sure enough, the moment I turned it on, the cocker spaniel acted as if he had sat down on a nail. It wasn't the program; I doubt if he cared one way or the other about fashion shows.

Listening at the back of the cabinet, I was just able to hear a very faint whistle. With the set turned off, I plucked out a certain 6SN7 triode. Triodes have one element more than diodes; it's the control grid, a few turns of very fine wire wound on two support rods and spaced just a hair off the cathode so that the electron stream must pass through the grid to reach the plate.

Being tiny negative charges, electrons are repelled by anything negatively charged (that is, with extra electrons of its own) and attracted by a positive charge. So if the control grid is positively charged, the electron stream will be pulled through. Charged negatively, it blocks electrons as a faucet does water.

In this 6SN7, the set's horizontal oscillator, the grid charge was being switched 15,750 times a second to power the sweep circuit that moved the picture beam across the screen. Although this frequency is barely within the human hearing range, it is well within that of man's best friend.

How was an oscillating electric current making itself audible as *sound* to Rover and myself? The tube was acting as a speaker. This particular 6SN7 had loose elements. Every time the current punched through, it jarred these loose elements—15,750 times a second. They vibrated the tube shell, causing the high whine that pained the spaniel's sensitive ear. Replacing this tweeter let the woofer lead a dog's life in peace.

The Set That Played Politics

WHEN our local pizza palace got a new 21" set, I made a no-cash deal with the owner: one year's service for a large pizza a week, with mushrooms.

During election season I walked in on a family wrangle hotter than any pizza. The boss's wife, who outweighs him by 40 pounds, was hefting one of the big pies as if trying for good aim.

"You tune it that way on purpose," she shrieked. "Just so I won't see my candidate."

"I don't. It's not my fault, and anyway that guy . . ." He mumbled something about a local office seeker. His wife glared, and it seemed the pizza would be flying any moment, so I butted in.

The husband turned to me with relief. "My wife likes one candidate, and I'm for the other one. Can I help it if the TV set won't get the locals right?"

He was telling the truth. All the local channels were so bright that the picture was completely washed out. But distant stations came in fine. Since his wife's party was campaigning heavily on TV, she thought he was pulling a fast one.

The chassis showed nothing but beautifully lit tubes. I brooded over my pizza.

Pentodes are tubes with two more elements than plain triodes. One is the screen grid, much like the control grid but between it and the plate. A strong positive charge on the screen grid has a terrific come-hither effect on the electron stream, giving it a hard shove toward the plate.

In this set a pentode was used for automatic gain control, a circuit that automatically adjusts contrast as the antenna signal varies because of weather, interference or other reasons. Without it, you'd have to readjust picture contrast every other minute. The "brain" of the automatic deal was a 6AU6 that sampled the incoming signal and turned the gain of the other tubes up or down to suit.

But the 6AU6 in this set had a broken screen grid. Although lit, it wasn't controlling the AGC circuit. That let all the other tubes run wide open. Powerful stations drove through so hard as to wash out their pictures. Weak signals produced better-than-usual pictures.

Replacing the tube brought the locals in normally, made the boss smile with relief, and left me free to finish my pizza.

The One I Didn't Solve

DURING a rush week, when I was leaving early every morning and getting home after 11 every night, my own set developed tube trouble. Too tired to check it, I kept putting it off while my wife went around mumbling something about shoemakers' children going barefoot. The set, she complained, turned on all right but after a few minutes the picture darkened and began rippling and weaving like something in a trick penny-arcade mirror.

When you have metal elements separated by a tiny insulating gap, as you do in tubes, you also have a condenser —whether you want it or not. This condenser effect (that of storing an electrical charge) is called stray capacitance. It's small in tubes, but if the spacing of the elements is a gnat's whisker too close, stray capacitance increases. Along with other circuit elements, such boosted capacitance can create an oscillation or electrical frequency all its own—strictly a maverick in the well-trained stable of normal TV impulses.

One of the picture-signal amplifiers in my set had developed too much stray capacitance and become a tiny oscillator. Its output was small, but was being amplified along with the video signal, getting bigger from stage to stage until it caused big ripples in the picture.

All it would have taken to straighten out the picture was a new tube. But I never did get around to putting it in.

So how do I know it was needed? My wife got tired of waiting for me. This morning I got a bill from my chief competitor—$5.65 for servicing and replacing a bad tube in my set. END

UP SHE GOES with a turn of the crank, and an extra set of "hands" holds a ceiling panel while you nail it up. Spring tension in the lift lets you slide a sheet to exact position.

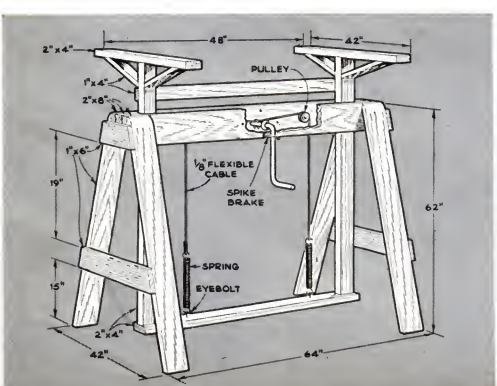
Elevator Makes Ceiling a One-Man Job

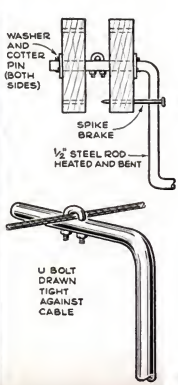
WITH this homemade lift as my only helper, I put up a plasterboard ceiling in jig time. The contraption raises a big panel at the turn of a crank, then holds it snug against the joists as I slide it to exact position and nail it.

The frame is an oversize "sawhorse," its rail made of two two-by-eights spaced to allow the two-by-four uprights of the elevator to move up and down between them. The dimensions shown were adequate for my 7'9" ceiling; for a higher one, you may have to make the horse somewhat taller.

The ⅛" flexible steel cable that hoists the elevator winds up on the shaft of the crank. The cable is anchored by a U bolt through the shaft. Springs between the cable and the bottom crosspiece give to let me slide the board around.

I built the lift in five hours at a cost of about $10. When the job was done, I took it apart and salvaged the lumber.—*Edward A. Babka, Columbus, Nebr.*





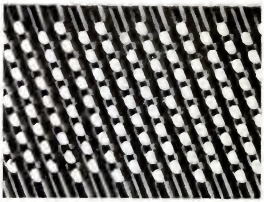
New Shaping Tool Grates Wood and Metal

THE tools above may look like familiar shop items. Actually you've never seen them before. What you see is really a brand-new way of shaping wood, plastic, metal—anything you want up to the hardness of mild steel. Each tool uses a single, interchangeable blade that will do most of the jobs of conventional files, rasps, planes, draw knives and spoke shaves.

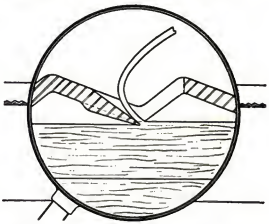
The blade is a special perforated steel strip. Instead of a single cutting edge, it has hundreds of tiny, sharp knives that skim the surface like a food grater. Because the cutting is done in small bites, you get a smooth, even finish. The blade doesn't tilt, skip, gouge or dig in.

You can plane the bottom of a door without splintering the cross grain at the ends. Soft materials like lead and plastic that quickly clog ordinary shaping tools are easy to work because the shavings pass out the blade's perforations.

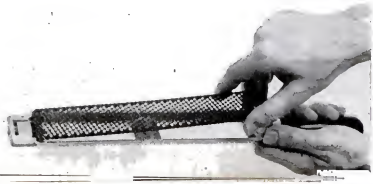
The blade is held in the metal frame of either tool like a jigsaw blade. When one becomes dull, you remove it and insert a new one. The rasp-shaped tool for beveling edges and shaping contours will sell for about $2.50. The block plane, for about $3.50, makes smooth, straight cuts. Extra blades cost $1.50. The Surform tools are made by Stanley Tools, 111 Elm St., New Britain, Conn.



GRATER-LIKE BLADE, shown above in actual width, has more than 450 tiny cutters. Diagonal arrangement provides shearing action that prevents splintering, leaves surface smooth.



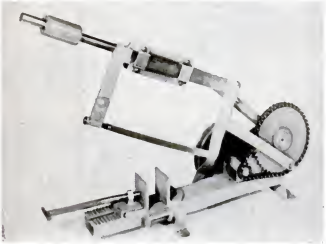
TEETH CAN'T DIG IN because they dip only slightly below surrounding metal, which rides on surface to control depth (above). Chips are thrown out through circular opening ahead of each cutter. Disposable blades lock into tool's frame (left), release quickly for replacement when they become dull. Identical blades fit both the rasplike tool shown here and the block plane.



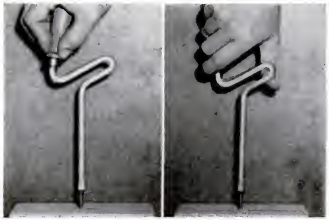
New Tools

1. Stand Puts Drill to Many Uses. A new low-cost, compact drill stand for ¼″ electric drills lets you use the tool horizontally or vertically as a table saw, drill press, disk sander, router, buffer or grinder. Its table tilts to any angle. The 5″ saw cuts 1¼″ at 90°, 1″ at 45°. The unit folds flat for carrying or storage.

More information *about the tools shown on this page can be obtained from: 1. Service Machine & Tool Co., 742 Burnet Ave., Syracuse 3; 2. Arco Mfg. Co., 1701 13th Ave. N., Grand Forks, N.D.; 3. Southwest Stores, Box 6231, Tucson, Ariz.; 4. Gunver Mfg. Co., Manchester, Conn.; 5. Firearms International Corp., 6521 Kerby Hill Rd., Washington 22, D.C.*

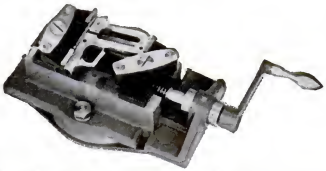


2. Power Hacksaw Saves Time. You can mount this unit, together with any chain-drive motor from ⅙ hp. up, set the work and go about your other business, sure of a clean straight cut. It uses a standard 10″ blade and can handle anything from conduit to 3″ steel pipe or 3½″-thick steel bars, taking off dime-thin slices.



3. Offset Screwdriver Works Fast. A twist of the wrist while you hold the swivel handle of this screwdriver (above left) makes driving screws easier. For an extra push to send a screw home, you press with your thumb against the U bend (right). Non-slip blades are made for slotted and Phillips heads.

4. Scriber Has Retractable Point. This vest-pocket scriber not only looks like a ball-point pen but it also has the same push-button-type retractable feature. The replaceable point of hardened steel loads like a ball-point refill, too.



5. Vise Clamps Odd Shapes. Two pairs of multi-swivel jaws on this universal clamp squarely contact even irregular work at four points. You can use it as a bench vise or as an outside or inside holding jig on the table or faceplate of many machine tools. One model has locking jaws for duplicate work.

Another Article About
The Other Fellow's Shop

His Shop Is a Firehouse

"Name a better place to remodel firearms than in a firehouse," says Carl Daniels, a dairy farmer with a whole herd of hobbies.

By William Gilman

ONE good hobby leads to another. That's the experience of Carl Daniels, a Vermont dairy farmer who runs his own private fire department, hunts deer with rifles that he has remodeled in his gun shop, fishes in three homemade ponds, and spends the rest of his leisure inventing farm machinery.

Carl's hobbies got their chain-reaction start 10 years ago. That was when he bulldozed out the basins for his trout ponds. By the time he was through, he had impounded more than two million gallons of brook water. Looking over the sizable pond that lay nearest

DANIELS AND HIS NEPHEW reel out the fire hose to shoot a practice spray on the barn.

to his farm buildings, Carl decided that he had a topnotch source of fire protection. He tracked down a surplus industrial engine pumper—a 500-gallon-a-minute Chrysler job—and bought it for $500. Carl figured that equipment like that deserved a firehouse. So he built one down beside the pond, a frame-and-clapboard building that was large enough to house not only the pumper but the overflow of power tools that cluttered his old barn workshop.

Water piped from pond to pumper. Carl ran a four-inch intake pipe from the pond to his pumper, laying it well below the frost-line to prevent freeze-ups. To get water from the pumper to any one of the buildings on his farm he welded together two dolly-based reels, each of them large enough to take 300 feet of high-pressure fire hose.

There was still one thing Carl needed to make his home fire department complete. That was an automatic alarm system. He took care of that by running 700 feet of special two-wire electric cord along the ceiling of his buildings. If a fire should break out anywhere, a temperature of 165 degrees would melt the insulation, shorting the wires and closing a circuit that would set a big gong clanging in the bedroom stairway of his home.

When insurance underwriters saw Carl's fire-fighting setup they were puzzled. They couldn't find anything in their scale of rural rates to cover such complete protection. All they could give him was the standard reduction for a farm with a nearby pond. But that didn't bother Carl. His whole investment, including the combination firehouse and shop had cost him only $2,000. He figures that his first serious fire call—if he ever has one—would more than repay him for his investment.

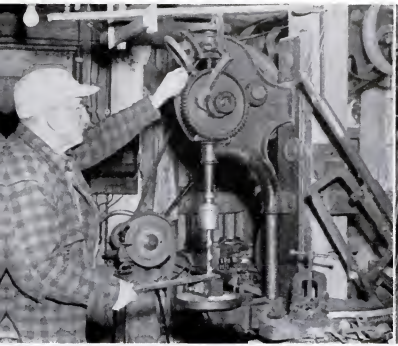
Meanwhile, the workshop section of the firehouse has given him a chance to expand his other hobby activities.

Blacksmith at work. He still does most of his heavy metal-working jobs in the original barn workshop. There he has his choice of three welding methods: with an oxyacetylene torch, a 180-

FARM'S AUTOMATIC FIRE ALARM SYSTEM isn't dependent on high-line power. Carl Daniels' nephew Glen explains the setup to his mother.

EVEN CARL'S HOMEMADE BLACKSMITH'S FORGE is gadgety. Here, he shows his grandnephew Philo how he controls the speed of the blower motor—by rheostat—to regulate the draft.

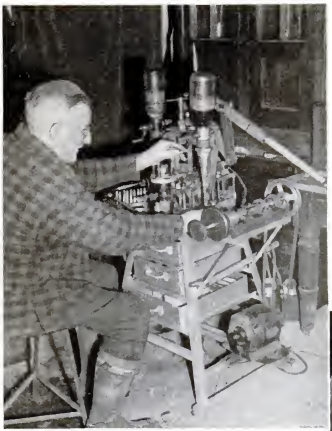
HEART OF STAY-AT-HOME FIRE DEPARTMENT is a 500-gallon-per-minute pumper, connected to hose reels that can be trundled to any building on the farm. It takes less than a minute to open a water-supply valve, kick over the engine and start reeling out the hose.



PUNY MACHINE TOOLS have no place in Carl's shop. This post-type drill press shares a two-horsepower motor with a husky grinding arbor and an improvised power hacksaw.

METAL-BONDING jobs give Carl his choice of using this electric arc welder, or his oxy-acetylene equipment. For old-fashioned "pressure" welds, he uses his blacksmith's forge.

FIREHOUSE GUN-CASE bears out Carl's contention that gunsmithing is his favorite hobby. Here he fondles a Mauser, one of many rifles and shotguns that he has remodeled.



SHELL-RELOADING STAND, the most elaborate gadget in the firehouse, is where Carl rebuilds ammo. Cone-like dispensers drop the right amount of powder in each shell.

CARL SALVAGES BULLETS fired on his rifle range, melts them down on a gas stove he made from a generator housing, and recasts them. He's sitting on a home-welded stool.

ampere AC electric welder, or his big homemade forge. Now that you can't find a blacksmith for love or money, Carl gets a boot out of his ability to forge-heat two pieces of metal and fuse them together with blows on an anvil. Other tools include a post-type drill press and a homemade power hacksaw.

Firehouse is handy to barn. For metal-turning, tool-sharpening, or his gunsmithing hobby, Carl steps across a driveway from his barn to his firehouse. There he has a man-size lathe with a 14″ swing and an 8′ bed, a second drill press and two grinding stands. One of these stands, specially designed for sharpening mowing machine knives, is typical of his resourcefulness. The telescoping stand that raises or lowers the arbor to a convenient height is a pipe assembly. Two grinding wheels, beveled in opposite directions, let Carl sharpen one side of the knife sections and then the other without reversing the work.

But the real eye-stopper is his bullet-rebuilding stand, a gadget-packed bench where he can melt down old bullets salvaged from his home rifle range, cast new ones, and resize old cartridge cases. There, too, he can reload the shells with just the right amount of powder, then crimp the shells around the bullets.

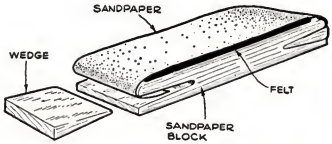
Perched on a welded stool, genial Carl Daniels looks about the firehouse with just a trace of worry. This second shop is almost as cluttered, now, as his old one was 10 years ago. It begins to look as though he'd have to start building himself a third one. END

These Gardeners Ride Their Power Mowers Like Bicycles

If an idea is good, it's apt to hit in more than one place. Here is how two readers now ride their power mowers.

Irwin H. Meyer, left, of Yakima, Wash., stripped the rear wheel, sprocket and pedals from a man's bicycle, spread the rear fork and bolted it to the handle brackets of his mower. He removed the controls from the discarded handle and attached them to the bike frame.

At Weirton, W. Va., Paul Blanc did the same thing with a girl's bicycle, except that he fastened the spread rear fork to pivot brackets which he made and mounted directly over the mower reel. He also added a pedal-height footrest.

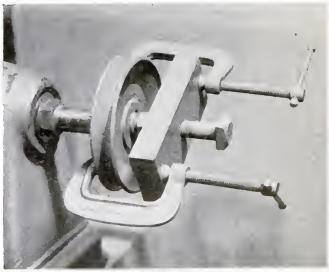


Tiny Block Sands Small Projects

A 3″ length of ½″-by-1″ stock can be made into a handy sanding block for work on models and other small parts. V-notch the ends for wedges cut slightly long so you can remove them easily. Then glue on felt and wedge in the sandpaper.—*P. Casperson, El Cajon, Calif.*

Tape Restores Worn Paintbrush

An old paintbrush that looks like a small boy's cowlick has a lot of life in it yet. Bind the bristles near the ferrule with electrician's plastic tape and you can still use it on rough surfaces.

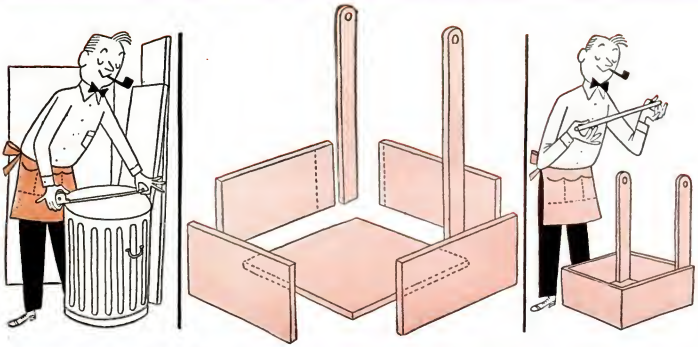


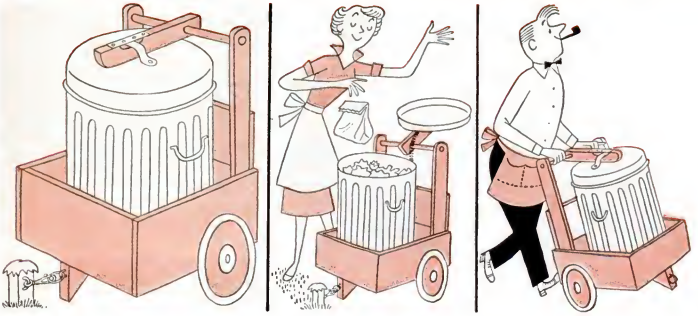
Block and Clamps Pull Wheel

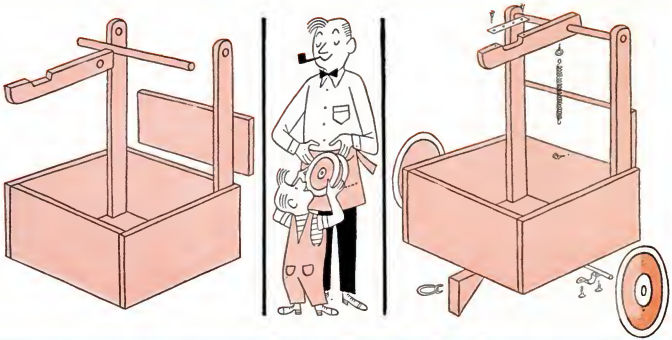
A wheel puller improvised from equipment at hand will get a stuck pulley or wheel off its shaft without effort. Cut a wood block to the diameter of the wheel and drill the center so a bolt with a nut will slide in it easily. Clamp to the wheel with the bolt on the shaft. As you hold the nut with one wrench and tighten on the bolt head with another, the wheel will be withdrawn slowly and evenly. —*Carleton A. Phillips, Corning, N. Y.*

By Roy Doty

Wordless Workshop







Next Month: A car bench to save Junior from sudden-stop tumbles

How to Build a Transistor

Who's ringing the doorbell? No need to stop everything to find

By Howard G. McEntee

WHEN the doorbell rings, you can answer it on this two-way phone from the kitchen, basement workshop, or upstairs study. A few words to the caller who wants somebody not in the house, the stranger at the wrong address, or a salesman, may save a trip to the door.

So simple that anyone can build it, this transistor device has other uses, too. It can be installed for communication with a basement, detached garage or attic apartment. Located in the nursery, it can tell mother if the children are chattering instead of falling asleep, or reassure little ones afraid of the dark.

Transistors are a natural for such a device, which should start instantly but draw no current when not working. This circuit takes so little even when it *is* working that the four pen-size cells used should be good for over a hundred hours of continuous operation. In ordinary intercom use, they should last a year. For baby sitting or other fairly continuous service, simply use larger cells.

One master station houses the power supply, amplifier, control switch and master speaker. The remote unit is simply another loudspeaker. Both speakers double very effectively as microphones.

Hearing the doorbell, the householder need only switch to "talk" to communicate with the caller, and to "listen" to hear him. In other applications, one can call from the master station by speaking. To be able to originate calls from a remote station not near the doorbell, run a third wire as shown in dotted lines in the wiring diagram, install a bell or buzzer and use size D cells.

The master station can be housed in a cigar box, with the dry cells and amplifier on a plywood chassis mounted on the box lid. Parts can be obtained singly or as a kit, the latter costing about $12.*

Layout of the parts is not critical, but mount the transformers at right angles to each other to minimize magnetic pickup. Two four-lug strips serve as tie points and transistor mounts. Cut the transistor leads about an inch long and then solder them directly to the lugs.

The control switch is a four-section, three-position type with spring return to center (off) position. If you want it to stay in any position, get one without the spring return.

One of the four sections is used only as tie points for condenser C1. The other three are treated as individual switches. Make connections as in the drawing.

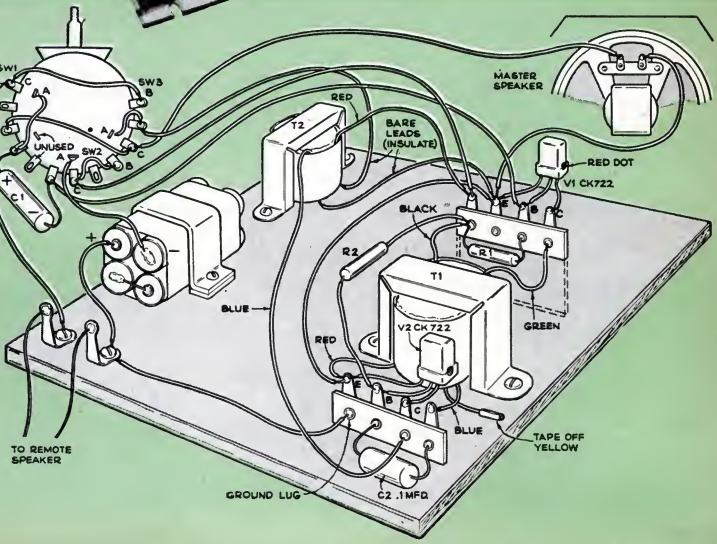
The switch is mounted on the case by its own bracket. Leaving room for the

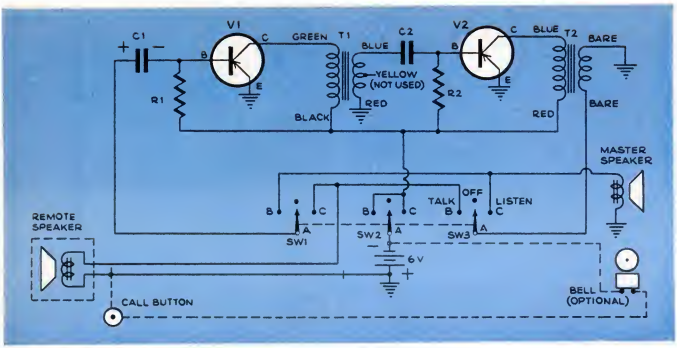
**Federated Purchaser, 1021 U.S. Route 22, Mountainside, N.J.*

Door Phone

out. Just press a switch and ask.

A FLICK OF A FINGER turns the unit on to "talk" or "listen." The entire master station fits into a 6"-square cigar box, shown at left turned upside down from its position in use. Chassis is assembled with lid swung down. Cut 3½" hole in bottom of box (which becomes front). Bolt the speaker behind this, with metal grille and cloth between.





loudspeaker above, drill two holes and cut a slot for the switch arm between them. Use long, flexible hookup wires between the switch and chassis.

Long battery life makes it practical to solder the four cells right into the circuit. Tape them together and clamp them on the chassis with a simple bracket. Solder wires on quickly with a hot iron to minimize heat transfer to the insides.

With the master unit wired, a soft hiss should be heard when the switch is on "listen" but the remote speaker is not connected. With the second speaker hooked up and near the first, the outfit will howl in either switch position. This will cease when stations are separated.

Check out the amplifier, if you have a milliammeter, for best gain and lowest current draw. The transistors may vary somewhat, but each should take from .75 to 1.25 ma. If either draws much more, try a higher value for R1 and R2.

Press the remote speaker into a coffee can as shown in the photos. Mount it near the bell button so that a caller will readily hear it and talk into it. A speaker may startle some visitors. You might post a note about it near the doorbell.

In exposed locations the unit should be mounted grille downward, or else with a simple plywood hood over it as shown on page 220. Carry the connecting wires around trim outdoors, along baseboards or picture molding indoors, to keep them inconspicuous. END

PARTS LIST

T1: Input transformer (Stancor A-4705)
T2: Output transformer (Stancor A-3329)
V1, V2: Raytheon CK722 transistors
C1: Midget 5 mfd., 6 volt electrolytic condenser
C2: .1 mfd. paper condenser
R1, R2: 100,000 ohm, ½-watt carbon resistors
SW: Mallory 7243C, 4-section, 3-position lever switch with spring return.
Speakers: Two 4" PM speakers, 3.2 ohm voice coils.
Misc: two 4-lug strips, one 2-lug strip or two single lugs, four pen-size flashlight cells, 6-32 mounting bolts, wood screws, two-conductor wire between stations, hookup wire, etc.

CUT SPEAKER HOLE 3½" in diameter in bottom of a coffee can. Fit metal grille inside. To it, cement grille cloth and a ring of corrugated cardboard cut to suit speaker rim. Speaker shown is a press fit in can, requiring no bolts to hold it. Mount the coffee-can lid on house wall with wood screws (center photo). Then press the can with speaker inside onto the lid. Secure with a tight wrapping of plastic electrical insulating tape as at right below.

Dividers Improve Storage Box

If you use cigar boxes for storage, add compartments to some to keep small parts separated. To make the tiny bins, cut down mailing tubes or the cardboard cores in rolls of wax paper. Line the bottom of the box with blotting paper, then put mucilage on the bottoms of the tube sections and press them down.

Outlet Fixed to Back of TV Set

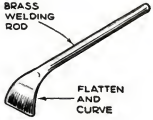
A wall outlet screwed to your TV set will provide handy receptacles for a lamp and an electric clock. Attach it to the back of the cabinet and run your power line through it. It's much neater looking than a three-way outlet from the baseboard.

Dowel End Makes Sanding Stick

Short ends of wooden doweling are handy for sanding. Glue emery or garnet paper around them and clamp with wire until the glue sets. Make an assortment of sanding sticks that you can use, hand held or in a drill, for smoothing round corners on metal or wood.

"Toothpick" Cleans Files

Stubborn chips that can't be removed with a file card can be picked out readily with this tool. It is made from a short length of brass welding rod. Flatten one end and bend it to a curve, as in the drawing. Use brass, which is soft and won't dull file teeth. *Karl Mickelson, North Chicago.*

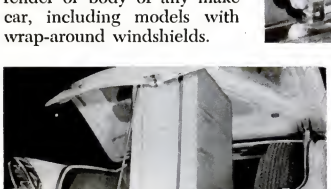


Small Tubing Bent on a Pulley

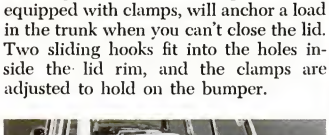
Small tubing can be bent without splitting or kinking if a pulley wheel is clamped in the vise to serve as a jig. If you want to make very sharp bends, it's best to start with a large wheel, then work down through smaller ones until you get the tubing bent to the desired radius.

New for Your Car

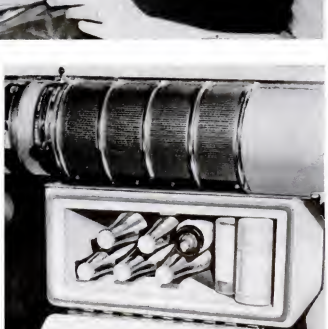
1. Mirror Matches Body. You can now get an outside rear-view mirror finished in a color to go with your car, or with only a primer coat so you can paint it yourself. For extra swank, it is available (in limited production) plated with 24-carat gold. The mirror can be adjusted to fit the fender or body of any make car, including models with wrap-around windshields.



2. Lash Secures Oversize Load. This 8½′ length of resilient neoprene cord, equipped with clamps, will anchor a load in the trunk when you can't close the lid. Two sliding hooks fit into the holes inside the lid rim, and the clamps are adjusted to hold on the bumper.



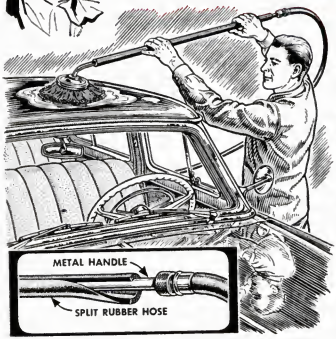
3. Air Mattress Fits Station Wagon. You can turn a Studebaker station wagon into sleeping quarters on a camping trip with specially designed air mattresses that spread on the cargo-area floor. Two side by side will cover the entire space.



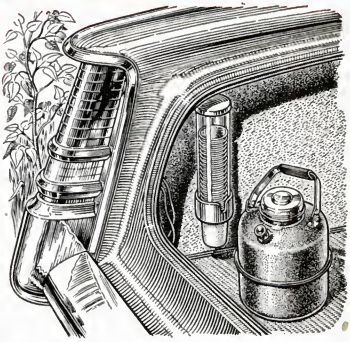
4. Gasoline Cools Drinks. A new under-the-dash refrigerator makes use of the principle that causes carburetor icing. Gasoline drawn from the fuel line by manifold vacuum passes through a coil of small copper tubing. Vaporized, the gasoline takes up heat, cooling the refrigerator and contents. The vapor then enters the intake manifold at the base of the carburetor and is burned.

More information *about these new car products can be obtained from: 1. Yankee Metal Products, Norwalk, Conn.; 2. G. G. Sales & Mfg. Co., 3058 W. Wolfram St., Chicago 41; 3. Studebaker Division, South Bend, Ind.; 4. B. & M. Corporation, P.O. Box 6, Houma, La*

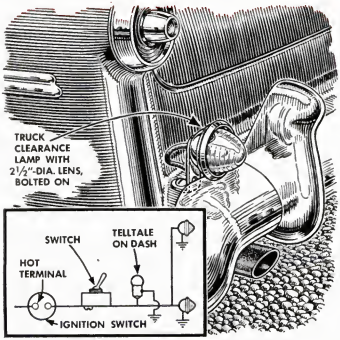
Hints from the Model Garage



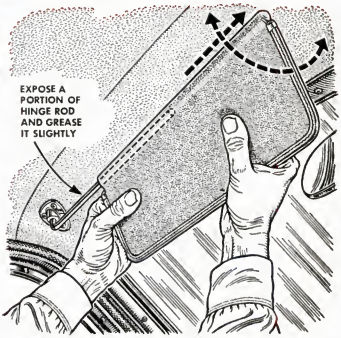
Protect the car finish if you use a mop-type washer like this. Slit a piece of rubber garden hose lengthwise and slip it over the handle. In cold weather the hose will also keep your hands warmer.



A paper-cup dispenser mounted in the trunk of the car is a handy accessory for those who have frequent picnics or roadside snacks. Sheet-metal screws will probably be best for mounting it.



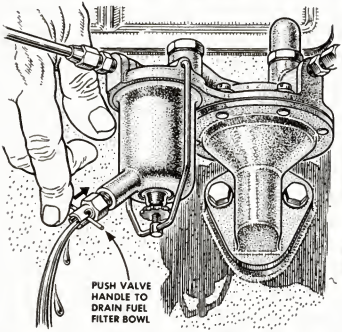
You can have back-up lights—practically in a jiffy. Buy a pair of chrome-plated truck clearance lights with clear lenses. They come complete with mounting brackets and are easily bolted in place. Wire in parallel. Control with a manually operated switch on the dash.



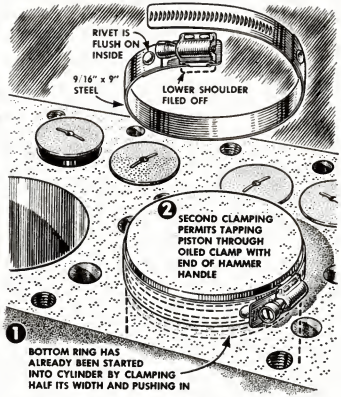
Up-and-down movement of a sun visor can be made easier on some cars by pulling it about halfway off the hinge rod with a twisting motion and applying just a touch of petroleum jelly. Don't pull it too far or apply too much jelly—you may loosen the visor too much.

Please turn the page for more auto hints

More Hints from the Model Garage

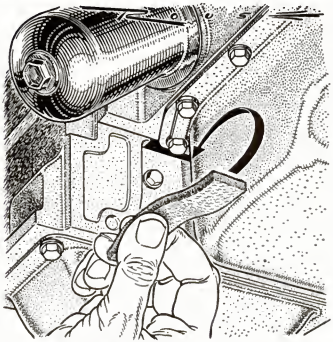


Quicker draining of fuel sediment can be provided in some cars and tractors by fitting on an airplane-type filter bowl in place of the regular glass bowl. These bowls have a drain valve at the bottom, which makes it unnecessary to remove the bowl itself. They are made in two diameters for light-plane fuel lines.

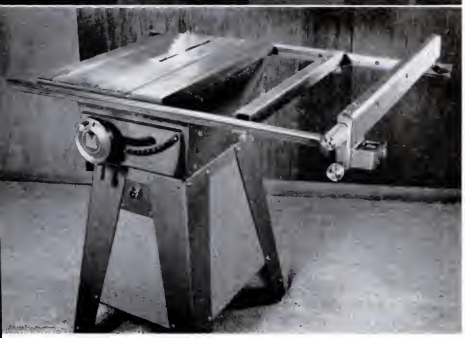


A piston-ring compressor can be improvised at little cost from a worm-gear hose clamp. File off one shoulder from the screw housing, hacksaw the gear band from the gear housing and rivet a strip of steel 9/16″ wide and 9″ long between them. Use the compressor as shown, first to compress one ring, then those above.

Fleece polishing pad gummed up with rubbing compound and polish? Put the buffer on the floor and turn it on, holding with one hand. With the other put a new wire brush gently against the fleece. This combs it out as clean as new.



Cement a piece of felt over the openings that you'll find on some Chrysler-built cars between the rear of the oil pan and the left and right sides of the front face of the clutch bell housing. This keeps dirt out of the clutch assembly.



2 New Saws Perform New Tricks

Fresh engineering ideas are brought to single tools by makers of a multi-purpose machine.

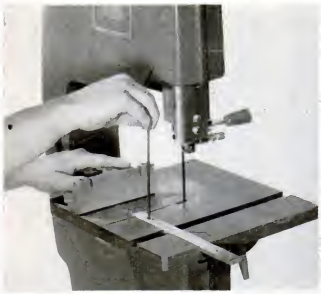
WHEN the manufacturer of a combination tool adds single-purpose tools to the line, it's news. In the case of a table saw and a bandsaw announced by Magna, makers of Shopsmith, there are some "firsts" that call for a quick double take. Both tools do things their kind haven't done before.

The new 9″ tilt-arbor saw has built-in extension bars that give it 26″ of rip capacity—but with a twist. There's a traveling crossbar that will support long work for crosscutting. Saw blades are mounted on detachable arbors; to change blades, you remove the arbor with a long hex wrench and mount another with the blade already on it. There is no need to block a saw tooth or use a wrench deep in the innards of the machine to take a blade off.

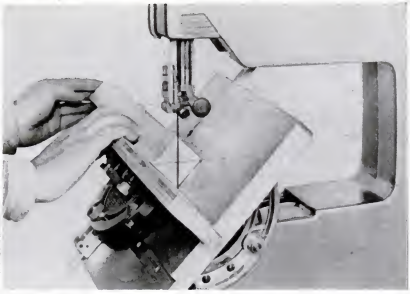
A single control knob sets both depth of cut and arbor tilt, the latter through a tricky speed gear that lays the blade over to 45° in about 10 turns and is claimed to be nonclogging. Zero and 45° tilt stops can be adjusted from outside the saw housing with an Allen wrench.

Even the table insert is different; it runs through to the back

Bandsaw has dual table grooves and reversible blade guides



SLIT MITER-GAUGE BAR can be expanded to lock in either table slot with a twist of a wrench. The dual table slots at right angles to each other are the first of their kind on bandsaws.



LOCKED IN A GROOVE and fitted with a wooden facing, the miter gauge becomes a fence for angle ripping, as shown above, or for resawing lumber (slicing thick stock thinner).

table edge, so there is no slot end for work to catch on. Colored yellow, the insert gives visual warning of the danger zone around the blade. The fence is self-aligning in any position. It has a vernier adjustment below the lock knob, and can be set against a scale on the table bar. An easily attached saw guard with a lifting handle is provided.

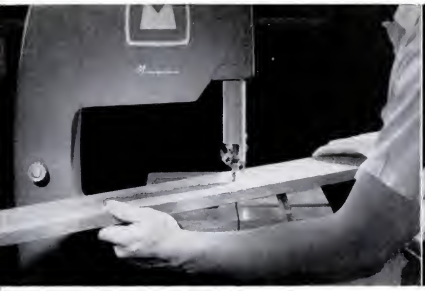
Even belt tension. Running on double-row ball bearings, the arbor is driven by two matched V belts. Belt tension is maintained even at 45° tilt, when the weight of the motor is ineffective, by a positive linkage working through a spring.

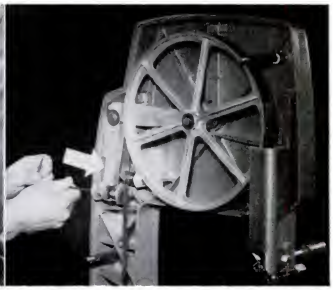
Priced at about $100 without the motor, the table saw can be mounted on a single stand or in combination with the Magna jointer on a newly available double-tool stand.

The bandsaw. Bandsaw news is made by a different wheel design that does away with the familiar tracking adjust-

Extension bars give table saw great ripping and crosscut capacity

ADJUSTABLE CROSSBAR between the long table bars supports work for crosscutting as below. It can be locked at any desired position by the knob beneath it. Rip fence rides on same bars. Control knob is pushed in to set depth of cut, pulled out to adjust tilt. Pointer mounted on the saw carriage indicates the angle of tilt against a large scale on the front of the saw.





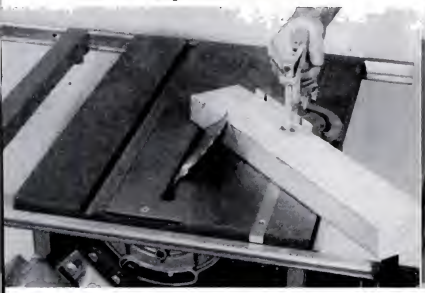
THIS CUT IS SQUARE to the board. Reversed guides twist the blade at 45°. Stock is crosscut by feeding diagonally across table. Boards up to 4½" wide bypass frame as shown. Blade tension is adjusted against a scale (arrow above) for various blade widths. Coned wheels cause blade to track against rollers as at right.

ment, by a blade that twists in the cutting area for crosscutting long boards, and by a second table slot, at right angles to the usual one, in which the miter gauge can be slid or locked.

Instead of being crowned (convex on the rims), the new wheels are coned, with the axles inclined as shown in the small drawing on this page. Since a blade tends to climb to the high side of a turning wheel, there is a constant backward thrust. This is taken by rollers behind the blade, which therefore tracks automatically. There is no wheel-tilt adjustment as usually provided on bandsaws to make the blade track.

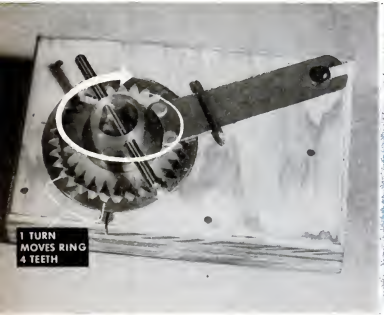
Changing blades. Blade tension is set with an Allen wrench by reading a tension gauge marked for various blade widths. To change blades, the polystyrene cover is removed, tension slacked off, blades are switched and the new one retensioned. The blade guide can be

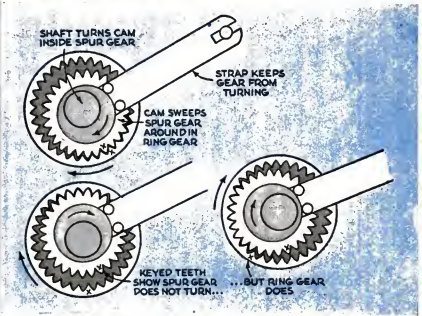
BLADE IS LOCATED to afford a 13½"-deep table area in front of it. Pistol-grip handle for the miter gauge is available as an extra. The saw cuts 1⅞" deep when tilted to 45°.



A LONG HEX WRENCH is the only tool needed to remove detachable blade arbor. This wrench has a depth scale on it, which gives true depth of cut regardless of blade size.

Two gears mesh but only one turns in table-saw tilt mechanism





INGENIOUS "JITTER" GEAR is illustrated by model above. The control shaft turns a cam inside a spur gear, which is kept from turning by a sliding strap. Eccentric action "walks" the 28-tooth spur gear around in a 32-tooth ring gear as shown above. Since the spur gear cannot turn, ring gear must move by the difference of four teeth per revolution between them.

raised or lowered with one hand operating a generous-sized lock knob.

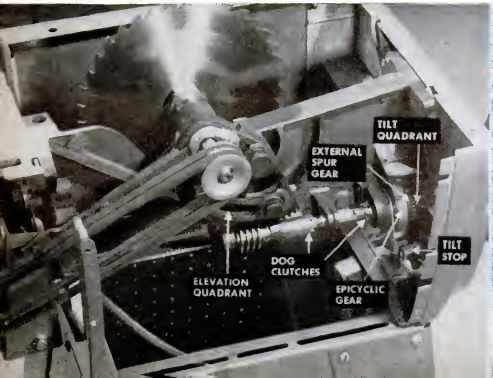
The bandsaw can be mounted on single or double power-tool stands or on the Shopsmith combination tool. It is priced at about $80 without motor.

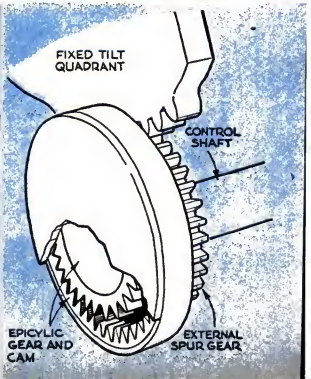
Magna's line currently includes a 6" belt sander that can be used horizontally or vertically, an air compressor for spraying paint and lacquer and inflating auto tires, a jigsaw and a jointer. These are made so that any one can be mounted on the Shopsmith and driven by its motor.

Ready-made stands. New to the Magna line is a single-mount stand for about $20, and a double-mount stand for about $23. On the latter, two power tools such as the jigsaw and sander, or the bandsaw and jointer, can be mounted side by side. The table saw and jointer can also be so mounted. A spring-loaded pulley maintains drive-belt tension on the jointer no matter at what height the saw happens to be, so that the work can be shifted from jointer to saw without changing the depth of the cut. END

How a single knob lifts blade and tilts arbor of the table saw

SAW CARRIAGE IS TILTED by an external gear cut on the outside of the ring gear. This external gear climbs a curved rack integral with the saw front, tilting the carriage. Epicyclic gear is irreversible despite its quick-acting ratio; weight of motor cannot drag it back.

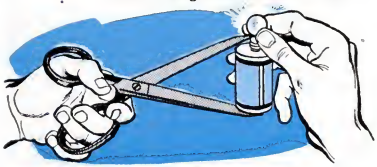




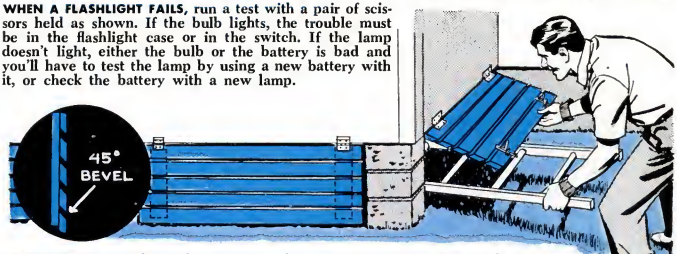
Keeping the Home Shipshape

STORE LARGE TRAYS within a pair of curtain rods or towel rods. You can screw the rods to an inner sidewall of any deep cupboard or on the outside of an end cabinet or an island arrangement as shown here.

CHECKING OFF JOBS that have been done gives youngsters a feeling of accomplishment. Put up a blackboard listing chores, then let the workers wipe the slate clean every evening.



WHEN A FLASHLIGHT FAILS, run a test with a pair of scissors held as shown. If the bulb lights, the trouble must be in the flashlight case or in the switch. If the lamp doesn't light, either the bulb or the battery is bad and you'll have to test the lamp by using a new battery with it, or check the battery with a new lamp.



CRAWL SPACE stays dry in driving rain if sealed off with louvered screens made with one-by-threes. A 45° bevel at top and bottom of each louver allows plenty of ventilation. Hang the screens on hinges or sash hangers and fix screw eyes to the bottom louvers to take lengths of ⅜" rod. Pushed well into the soil, the rods will keep the screens from banging in the wind; or pulled up, offer access to the crawl space beneath house or porch.

Please turn the page for more home tips

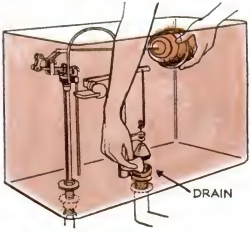
More Home Tips

A CLOTHESLINE PROP that falls down on the job can be made to stand up even in a strong wind with a little redesigning. Just increase the length of the V cut in the end and finish off with a hole that will take a tight grip on the line.

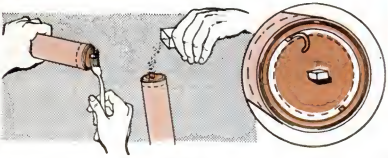
BEFORE STOWING AWAY LUGGAGE, touch up any scuffed areas with a coat of matching liquid shoe polish. After it has dried, finish with a thinned coat of pure white shellac to hold the polish and give a glazed finish.

A CLOTHESPIN BAG that can be hung on a closet rod will hold a large collection of children's or men's socks. Selection is easier than when socks are scattered around in a large and crowded drawer.

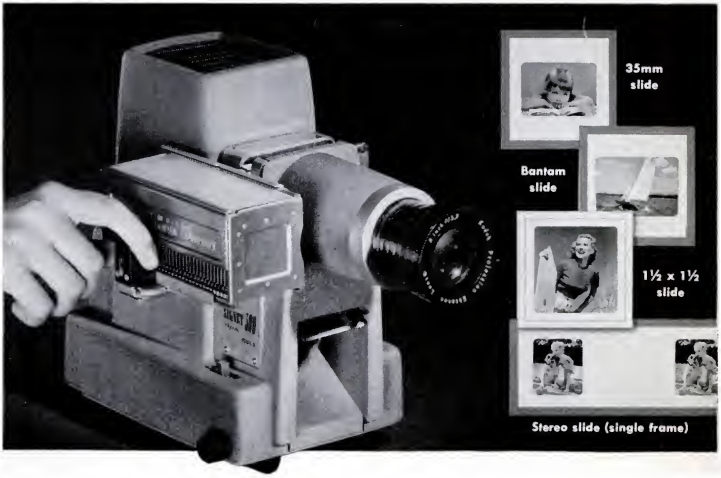
A TIGHT-STUCK LID of the screw-on variety can often be coaxed to give with the aid of a rubber glove. Turn back the cuff of the glove and slip the double fold over the lid to cushion your hand and to provide a non-slip surface that you can get a firm grip on.



WATER LEAKAGE from a flush tank may occur if deposits keep the rubber bulb from seating tightly. Clean the drain opening periodically. Flush the tank, holding the float up to keep it empty, and scrub the drain with steel wool.



IF A WINDOW SHADE SNAPS UP, dust in some graphite. To distribute the powder, wind the spring up tighter, using the tines of a fork (left), and release. The graphite will make the pin-pivots on the tiny catches hold again.



Now! Shoot the size of color slides you like best . . .

Kodaslide Signet Projector handles them all!

You probably already know why Kodaslide Signet Projectors are the toast of discriminating color slide fans. Their thrilling "big-screen" performance and handling ease have made them famous.

You probably know, too, that there's a wide selection of Signets to choose from—one with exactly the features you want at the price you want to pay.

But did you know this? . . . *No matter which model you choose, your Signet will project all 4 popular sizes of color slides!*

Think of the satisfaction of being able to project 35mm slides, Bantam slides, *big* transparencies from size 620 or 120 color film—or even single frames of stereo slides. With a Signet, you can project your friends' slides—no matter which size they take!

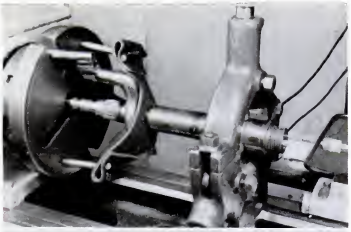
Your Kodak dealer will gladly show you the Signet 300 (shown above) that comes complete with an automatic slide changer and carrying case for only $79.45. Other superb Signets from $59.50 to $105.50. Most Kodak dealers will arrange convenient terms.

Kodaslide Dial-Lite Viewer—Plugs into any house circuit. Brightness knob dims or brightens light to suit subject being viewed. Accepts *all 4* popular sizes of color slides (described above). Complete with desk tray for slides and viewer, **$12.95.**

Prices are list, include Federal Tax, and are subject to change without notice.

Eastman Kodak Company
Rochester 4, N. Y.

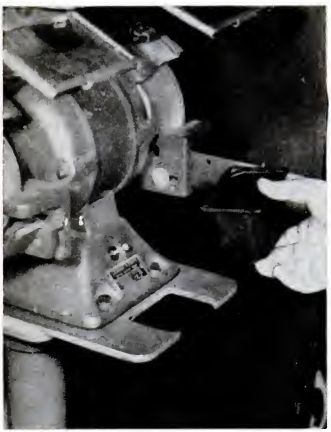
New Shop Ideas

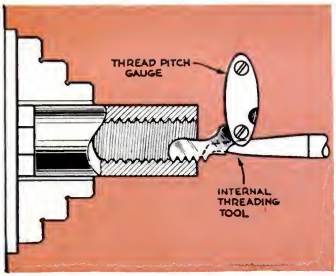


Strap Holds Work on Center. An accurate way to bore a socket or internal taper in a shaft is to run it in a steady rest with one end tied against the live center. But lacings used for this may loosen, letting the work slip off.

A scrap of leather belting with five holes punched in it, plus two T bolts made by welding on crossbars or bending a head on threaded rods (bottom right), will anchor the work securely. Double the ends of the strap over and push a bolt through both holes in each end. Mount with washers and nuts behind the faceplate (top right).

Plate Holds Coolant Can. A ¼"-thick metal plate, sandwiched between a grinder and its support, will hold a flanged water can. Whatever its shape, cut the opening far enough inside so that the can will not slide out, but can be lifted out.—*J. C. Magee, Schenectady, N. Y.*





Picking Up Internal Threads. Setting a tool to finish a partly cut internal thread is easy with a thread-pitch gauge.

Engage the half nut and run the tool near the end of the work under power to eliminate backlash. With the nut still engaged, hold the proper gauge leaf on top of the tool and in the existing thread groove, letting a few teeth protrude. Align the tool point with one gauge tooth by adjusting cross and compound feeds. A magnifying glass will help.

As a check, set the tool with the cross feed to barely engage the groove, and pull the lathe belt by hand a few turns.

 Please turn to page 236 for more shop tips

MEN WITH MECHANICAL SKILLS:

CAN YOU MEET THIS CHALLENGE?

Mechanics Creed

Upon my honor I swear that I shall hold in sacred trust the rights and privileges conferred upon me as a certified mechanic. Knowing full well that the safety and lives of others are dependent upon my skill and judgment, I shall never knowingly subject others to risks which I would not be willing to assume for myself, or for those dear to me.

In discharging this trust, I pledge myself never to undertake work or approve work which I believe to be beyond the limits of my knowledge; nor shall I allow any superior to persuade me to approve aircraft or equipment as airworthy against my better judgment; nor shall I permit my judgment to be influenced by money or other personal gain; nor shall I pass as airworthy aircraft or equipment about which I am in doubt, either as a result of direct inspection or uncertainty regarding the ability of others who have worked on it to accomplish their work satisfactorily.

I realize the grave responsibility which is mine as a certified mechanic to exercise my judgment on the airworthiness of aircraft and equipment. I, therefore, pledge unyielding adherence to these precepts for the advancement of aviation and for the dignity of my vocation.

If you are a man who takes real pride in a job well done, the Air Force offers you a challenging and rewarding career. The safety of our country, and the lives of its defenders, depend on your accuracy and devotion to duty. Act today and put your skills to work tomorrow—in the U. S. Air Force.

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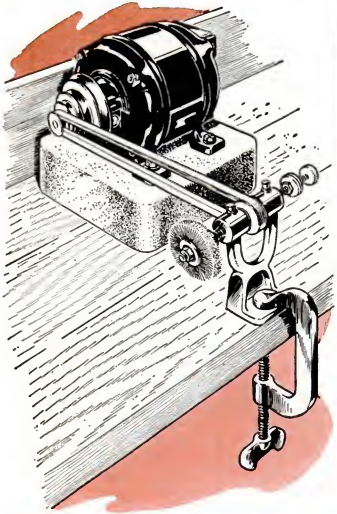
Please send more information on my opportunities for enlisting in the U. S. Air Force. I am between the ages of 17-34 and reside in U.S.A. or possessions.

Name_____

Address_____ Age____

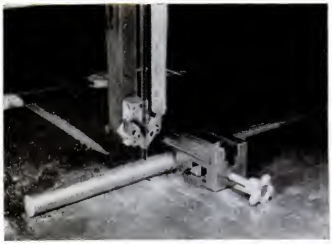
City_____ Zone____ State____

More Shop Tips



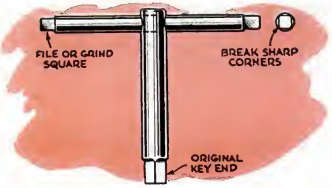
Power Tools Made Demountable. Bench space is so valuable in our shop that we set up the watch lathe, grinder, buffing wheel or sensitive drill only when needed. These machines are clamped to the edge of the bench, and small motors are mounted on heavy cast-iron blocks as above.

A motor is simply shifted into alignment and pushed back to tension the belt. There is no belt slippage. The rig is quickly put away to clear the bench for other work.—*C. H. Willey, Concord, N. H.*

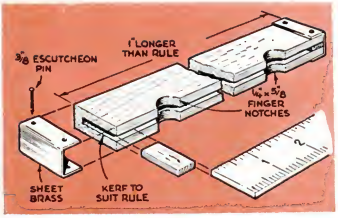


Saw Round Stock Safely. Hand-held round pieces, whether wood or metal, tend to roll against a bandsaw blade and jam in the cut. This may strip teeth, damage the work, and endanger your fingers.

A drill-press vise clamped upside down on the stock and resting on the table makes the job safe. The vise is a convenient hand hold and keeps the work from turning.—*H. J. Gerber, Stillwater, Okla.*

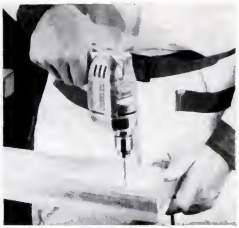


Key Fits Three Chucks. Where there are several chucks, each may require a different key, and if the right one is mislaid the chuck is useless. But the largest key can probably be made to fit three chucks. File or grind the two ends of the handle square as shown.—*Frank La-Saracina, New York City.*



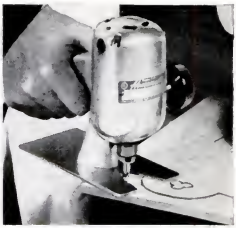
Case Protects Rule. A machinist's steel rule will be saved many a nick if kept in its own case. In a $\frac{5}{16}$"-thick piece of straight-grained wood, rip a kerf deep enough to accommodate the rule. Glue in a small piece to close each end, and cut finger notches as shown at the left.

Bend U-shaped clips of $\frac{1}{32}$" sheet brass and fasten them on the ends with escutcheon pins riveted over. Finish with shellac.—*John A. Blaker, Auburn, Mass.*

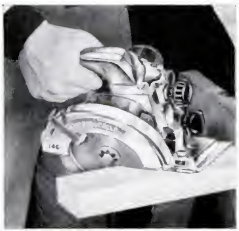


Model 137 ¼" Drill. Compact and handy, yet extra-powerful. Precision-ground gear chuck, trigger switch with locking button. Only $26.95.

Model 136 Sander. Precision-built 3" belt sander handles every sanding job. Powerful universal motor, trigger switch, instant belt tracking control. Only $69.50.



Model 140 Routo-Jig. Versatile 3-in-1 tool that's a high-speed router and rotary jig saw—accessory table makes it a precision shaper, too. Only $49.95.



Model 146 Saw. Rugged 6½" professional-capacity saw cuts 2" dressed lumber at 45°—makes every cut it takes to build a house. Only $69.50.

Model 148 Bayonet Saw. Exclusive orbital action cuts up to 4 times faster. Full 2" capacity in wood, ¾" in aluminum, ¼" in steel. Only $99.50.

Model 145 Sander. High-speed orbital motion sands with, against or across the grain—powerful universal motor gives long, trouble-free service. Only $34.50

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PORTER-CABLE MACHINE COMPANY, 6159 N. Saline St., Syracuse 8, N.Y.

Combination Green-Red Bow Light Is Made with Divided Lens

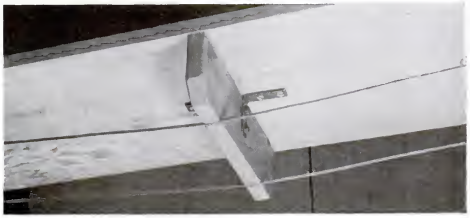
To MAKE a deck bow light for your outboard, saw green and red plastic lenses in half, using a V block, as above. Cement two halves together and mount in a standard light housing.

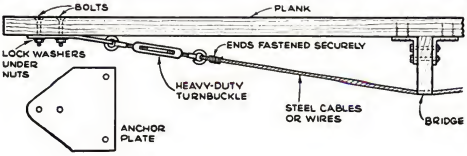
At the stern, use a light with a clear lens bolted to the flattened end of a piece of thinwall conduit. Drill a 5/16″ hole near the top, insert a grommet, and run the wires down the tube. Wire for battery operation from one switch.—*L. E. Johnston, Madison, Wis.*

Wire Brace on Underside Doubles Strength of Scaffold Board

BRACING a 1″ plank can give it the same strength, for scaffolding, that 2″ stock has. It costs half as much, and is more readily reusable on other jobs.

With screwed and bolted angles, fasten a bridge to the center, as in the drawing, and bolt an anchor plate to each end. Then stretch two wires taut between the plates and across the bridge. Put a turnbuckle in one end of each wire, and turn it tight before use.





IT'S YOUR PROJECT...GIVE IT THE BEST!

You're putting all you have into this job. A lot of planning, hours of time, painstaking care, maybe a dream or two . . . Now! Give it that final touch of permanence — the best Screw you can buy.

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Gus Defends a Woman Driver

[Continued from page 192]

"Drive just as you always do," Gus told Mrs. Whipple.

She picked up speed to a steady 50 miles an hour after they struck the smooth, open highway to Stanfield.

"Runs sweet," Gus commented.

"Relax," Mrs. Whipple told him. "It's 40 miles to Stanfield. It never cuts up until I'm at least halfway there."

"Probably won't tonight," Whipple grumbled. "You won't have the emergency brake on or ride the brake pedal."

Mrs. Whipple grimaced but didn't reply. She just drove. There was no sound save the hum of the motor, the swish of tires on pavement. They were fully 25 miles out before Gus suddenly jerked erect, his keen ear detecting a change.

"It's started," Mrs. Whipple said delightedly. "From here on we'll have hot water and less power."

"What!" Whipple exclaimed from the back seat. "In this car? Impossible. Watch her, Gus—she may be riding the brakes on the sly."

GUS looked down at trim ankles and up to check the instrument panel. Yes, the heat-gauge needle had moved up slightly. There seemed to be a little less power.

"It's got to be her driving," Whipple protested, feeling the power loss now himself. "I drive this car every day. I tell you, Gus . . ."

"It isn't her driving," Gus said flatly. "She drives well. Now with the same car and equally efficient drivers, we've got to look beyond these identical factors. We've got to look at variable factors."

"Equally efficient drivers!" Whipple exclaimed in protest.

"Get the chip off your shoulder, Henry," Gus said, "and let's get our heads together on this. What difference is there in your driving, Henry—distance, speed, route, load?"

"Same load," Whipple said. "One person. I drive farther, maybe faster. I drive during the day, of course, and she drives only at night."

"I know about where you go in calling on the various dairies," Gus said. "I know most of them. But I can't see why night and day, or route, should make any difference."

Gus was thinking about Henry, driving around, selling equipment for contented cows, when the headlights lit up a white sign, which indicated a road turning from the highway.

"Pull up a minute," he said to Mrs. Whipple, and when she had stopped he got out, lifted the hood, flashed his light on the motor and got back in.

"Take the branch road," he told her.

"Why?" she asked. "It isn't paved."

"Neither are the roads your husband drives on," Gus told her. "It might make a difference. Roll it. Don't worry about chuck holes. We're grabbing at straws, ma'am."

MRS. WHIPPLE looked into Gus's face searchingly—and she rolled it. As the car bounded over the rugged country road, Gus felt it gradually regain its lost power. The heat gauge, which had stood at 190, dropped slowly to a normal 180.

"Ah," Gus breathed. "Pull up at the first turnout."

When they had stopped, Gus got out, took a piece of wire from his kit, worked under the hood a few moments and got back in the car.

"It's all right now," he said. "Your heat valve was causing the trouble after all. A defective bimetallic spring."

"Impossible!" Whipple exclaimed. "How could anything possibly cause a car to act up at night and not during the day?"

"Impossible?" Gus said, smiling. "That's what I thought until I satisfied myself that your wife was a good driver and began to think of the variables. This heat valve is a tricky little gadget, installed in the manifold. A counterweight holds a valve closed on a cold engine, so that the mixture from the car-

[Continued on page 242]

10-to 12-pt. Disstons recommended for smoothest cuts in plywood and other well-seasoned woods

When you're cutting plywood and want a beautifully smooth finished edge, you've got to use a saw that's made for finished work.

That's a 10-, 11-, or 12-point Disston. These fine-toothed saws often make the difference between fine workmanship and an ordinary job. They are specifically designed to be used for finishing.

So if you've been trying to cut plywood or other well-seasoned woods with an 8-point saw, ask at your hardware or tool store for a Disston D-23 in 10-, 11-, or 12-point. You'll get a saw of fine tool steel, with perfectly tempered and double taper ground blade . . . a saw you'll use and treasure for a lifetime.

CARLSON
STEEL TAPE RULES AND TAPES

WHITE CHIEF (6 ft.) $1.80 — *BIG CHIEF* (12 ft.) $3.50 — *STAR CHIEF* (50 ft.) $5.00

Finest quality long tapes and pocket-size rules for every purpose. From 6 feet to 100 feet. Accurate, easy-to-read. Double graduations, feet and inches. Stiff, rigid, easily-changed blades. Easy-action swing tips.

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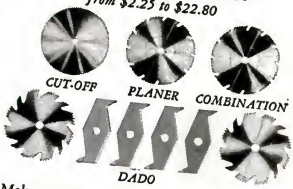
CIRCULAR SAWS AND DADOS
from $2.25 to $22.80



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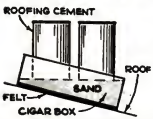
Blocks Raise Child's Seat

WHEN a youngster outgrows a high chair, shim up a metal kitchen chair with wood blocks like this. Unscrew the seat and screw two one-by-two pieces under it. Put the original screws back through the tubing into the blocks.

Sand Levels Roofing Cement



WHILE repairing a pitched roof, a farmer I know places open cans of roofing cement in a cigar box half-filled with sand to keep them level. Two holes in the lid receive the cans. Felt cemented to the box bottom keeps it from sliding. —*William B. Eagan, Flouds Knobs, Ind.*

Gus Defends a Woman Driver
[Continued from page 240]

buretor will be heated quickly by exhaust gases. A bimetallic spring opens this valve when it warms up. If the valve doesn't open after warm-up, you get overheating, restriction of exhaust gases, and inefficiency from the too-hot fuel mixture. It reduces engine power and causes poor gas mileage. I thought of this right away in the garage, but the valve seemed all right then, open as it should be on a warm engine."

"But how about this day-and-night business?" Whipple spluttered.

"Remember," Gus said, "that your trouble is a faulty spring that is supposed to open this valve. The engine is cold when you start in the mornings, and the valve is closed by the counterweight. When your motor warmed, the spring, being defective, wouldn't open the valve, but by that time you would have hit country chuck-hole roads, and it would be bounced open. Mrs. Whipple, driving only on pavement, didn't have that kind of luck."

"You're only guessing, Gus," Whipple declared. "How do you know that it doesn't bounce open for Frieda and does for me?"

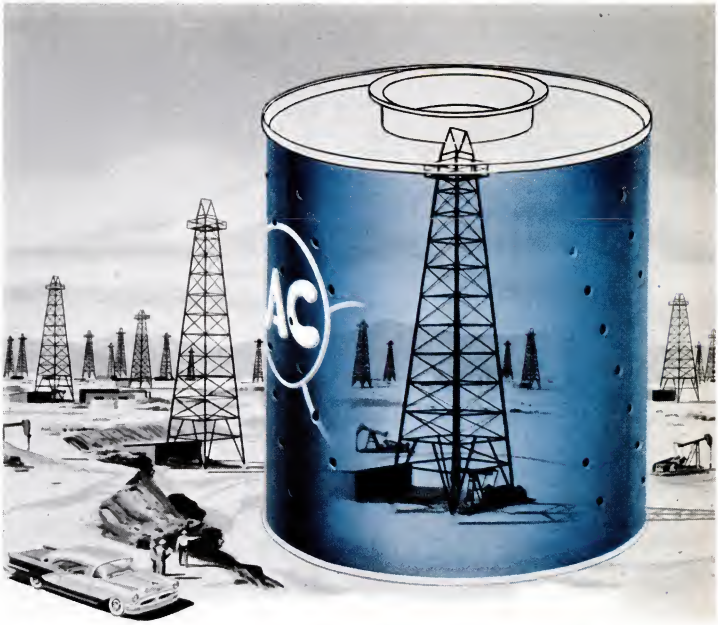
"On this one," Gus chuckled, "I had to be sure. That's what I got out for, back there. It was closed on a warm engine before we left the highway, and it was open when I looked at it here. I tied it open with wire. Bring it in tomorrow and I'll make a permanent repair."

MR. and Mrs. Whipple looked at each other. Slowly they began to smile, then broke into laughter.

Whipple roared, waving his glasses and wiping laughter tears from his eyes, "How could a cow be contented with me in the barn? Oh, my sacred aunt!"

The Whipples seemed so delighted with each other that Whipple didn't move to change cars when Stan Hicks drove up. Whipple, for this evening at least, seemed quite content to wait for his wife in Stanfield. END

NEXT MONTH: Gus saves the livestock.



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There are many square feet of filtering area packed into an AC Oil Filter, and they're packed so precisely parallel that the filtered-out sludge deposits evenly over the entire area. That's why an AC Oil Filter works at a three-gallon-a-minute pace and maintains its full filtering efficiency throughout the recommended 5,000-mile period. Your AC Oil Filter doesn't remove an ounce of useful detergent from your oil, either. So—always say AC when you change your filter.

AC OIL FILTERS

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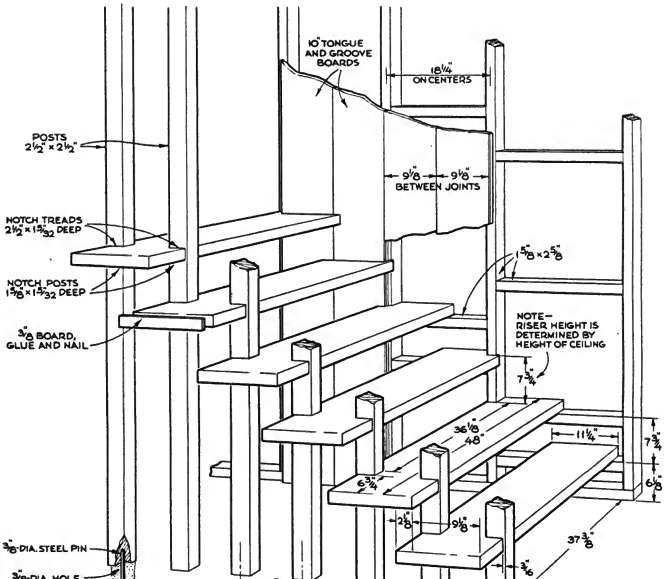
AC SPARK PLUG THE ELECTRONICS DIVISION OF GENERAL MOTORS

Stairway for Moderns

[Continued from page 100]



furnace, tubs and a workbench the other.

Eventually, rather than attempt to dress up the old stairway, Ray decided to scrap it. After making several rough sketches, he consulted an architect, a couple of builders and his local lumber-building materials dealer.

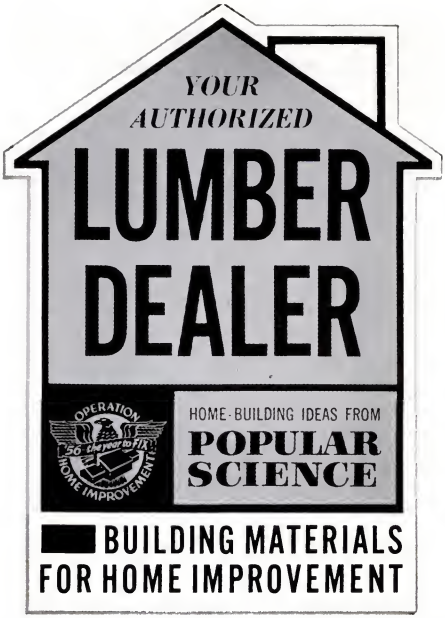
With this help, he evolved a stairway that uses two-by-twelves for treads and three-by-threes for a line of posts into which the treads are notched at one end. The dividing-wall framing supports the other ends of the treads.

Easier to build. The interlocking design does away completely with notched stringers. This and other features caused the carpenter who put up the new stairway to describe it as easier to build than the conventional type.

Rough three-by-threes were chosen for the posts after ordinary two-by-fours had been considered and discarded as of too poor quality for the job. The lumberyard cut and dressed the posts to a finished dimension of 2½″ by 2½″ from three-by-ten Douglas fir floor beams. Kiln-dried Douglas fir was chosen for the 4′-long treads. Eleven treads were required, 12 posts. Treads and posts cost a total of $82.40. To have a carpenter build the stairway, you could expect to pay a minimum of $450 for labor and materials, including those for the wall.

Using free space. To make use of the space behind and under the stairway, the Piochs anchored a children's luncheon bar to the posts and placed shelves in

[Continued on page 246]



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NRLDA

NATIONAL RETAIL LUMBER DEALERS ASSOCIATION

18th & M Streets, N.W., Washington 6, D.C.

[Continued from page 244]

that corner of the game room. A door at the foot of the stairway leads through the paneled dividing wall into the utilities section of the basement.

The stairway has a run of 8′ 5″—the basement-floor distance from the front edge of the bottom tread to a plumb line dropped from the riser at the first-floor landing.

A key dimension is 9⅛″. This is the effective tread width, the distance from the nose of one tread back to the point where the tread above overhangs. The posts also are placed on 9⅛″ centers. And the measurement from joint to joint of the 10″ tongue-and-groove paneling on the wall is 9⅝″.

For the 11-step stairway, the rise—the distance from the top surface of one step to the top surface of the one above or below—worked out to 7¾″.

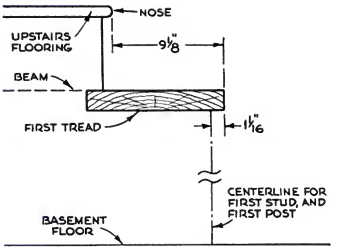
In new construction, the handsome, modern appearance of the stairway makes it a candidate for the living room as well as the basement. In the living room, the space behind and under the steps could be devoted to house plants or an aquarium.

It's precut. The man who wants to build it himself, perhaps in a basement, will find an advantage in the fact that the dimensions permit cutting and fitting the new parts before the old steps are removed.

Here's how you build the stairway:

To lay it out, drop a plumb line from the nosing of the first-floor flooring at the head of the existing stairs. From this line, measure out 9⅝″ along the lower edge of the joist adjoining the stairs. (This point eventually will be the nose edge of the first step of the new stairway, this tread being notched into the joists as necessary to keep the rise constant between steps.)

From the 9⅝″ point measure *back* $1\frac{1}{16}$″ and drop a plumb line to the basement floor as shown in the accompanying sketch above. This line becomes the centerline for one of the studs in the dividing wall—and on the opposite side



of the stairway for the first three-by-three supporting post.

Framing the wall. The dividing wall is framed with two-by-threes. Locate the top plate flush with the inside edge of the joist that bounds one side of the stair well. Anchor the bottom plate to the floor with cement-penetrating nails.

Center one of the studs on the plumb line already established, then position four others along the base plate on 18¾″ centers. Beyond these, place a fifth stud on a 22″ center. Since this stud will support the door jamb, the extra spacing will keep the door trim clear of the bottom tread of the new stairway.

When all studs are in, place horizontal stretchers between them to support the treads. Two stretchers go between each successive pair of studs, one above the other at the proper distance to give the desired rise to each step.

Riser height. To determine your rise, divide the first-floor to basement-floor distance by 12—the number of riser spaces in an 11-step stairway. If the resulting figure is much above 8″, your stairway will be too steep for safety. In that case, add an extra three-by-three supporting post for a twelfth step—and a correspondingly lesser rise.

Place the first tread-supporting stretcher between the pair of studs at the foot of the stairway. In doing this, remember that the actual thickness of the treads is 1⅝″. Locate the first stretcher at a height which, with 1⅝″ added, will

[Continued on page 248]

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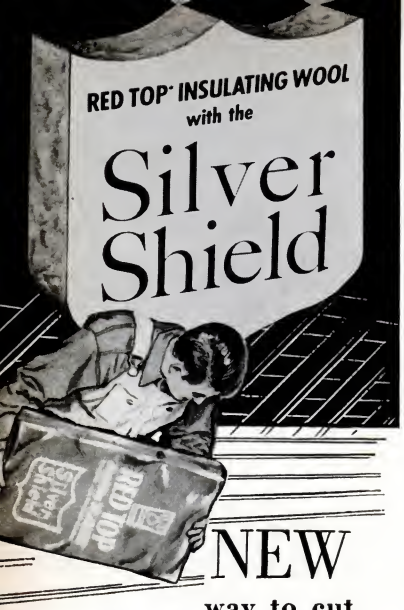

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Stairway for Moderns

[Continued from page 246]

bring the top surface of the first step 7¾″ from the floor—or whatever you have figured the necessary rise to be.

The second stretcher also goes between the first two studs, with its upper edge 7¾″ above the top edge of the first stretcher. Then move over and place two stretchers between the second and third studs, two more between the third and fourth, and so on up the line. Secure these stretchers by toe-nailing and by driving one or more hefty nails through the uprights into the end of each.

The posts. Anchor the three-by-three posts to the floor by drilling centered holes in the bottom of each for ⅜″ steel pins 3″ long. Let the pins project an inch or so and thrust them into holes drilled in the concrete floor.

Drill these floor holes in a line 37⅜″ from the near edge of the wall framing. Locate the first one by running a line at right angles from the plumb line used to establish the center of the first wall stud. Then spot holes for 10 other posts, each on a 9⅛″ center. (A twelfth post was placed under the boxed-in longitudinal beam in the Pioch stairway.)

The posts in the Pioch stairway lined up so that, when they were plumbed, their tops rested against the side of a joist on the basement ceiling. In the final assembly, therefore, it was possible to toenail each post to the beam after a little shimming here and there. If yours cannot be made to line up this way, a two-by-four plate on the ceiling will provide a way to secure the tops.

The treads. Now cut notches in the treads to interlock with others in the posts. Locate these on a center 8″ from one end of each 48″-long tread, cutting out a notch 2½″ wide and $1\frac{5}{32}$″ deep on each side. A corner notch must also be cut at the wall end of each tread so it will fit around the corresponding stud.

With the posts temporarily in place, mark them for notching by using the same dimensions you used in locating the tread-supporting stretchers in the wall framing. Mark each post for the lower

edge of the tread. Then, as a double check, rest the end of a long level on each wall stretcher in turn, bring the other end against a corresponding post, and make or check a mark at its lower edge when a co-worker reads the bubble at the absolute horizontal. Lacking a level this long, you can rest a shorter one on a rigid straightedge.

Now take down the posts and cut the notches, making these 1⅝″ wide and the same depth as these in the treads, $1\frac{5}{32}$″. The old stairway can be removed at this point, for the new one is ready for final placement and assembly.

Assembly. Beginning at the top, install the first tread down from the landing. This alone of all the treads is not supported by the posts. Cut it off at the post line and notch either it or the joists so that the rise to the flooring is equal to the rise in the rest of the stairway. Nail it to the beams and, for additional strength, support it with a pair of heavy metal brackets. Fit in a riser board to close off the space between the beams.

The first post can now go into place, then the first notched tread, followed by the second post. Plumb each post as you continue down the line and see that each one is square with the treads.

Toenail the top of the posts to the beam and the treads to the posts. Also nail the wall end of the treads to the horizontal stretchers. To counteract warping, nail in tie-down stretchers against the top of the treads in the wall framing. Finishing strips of ¾″-thick material glued and nailed to the free tread ends also help combat warping.

As part of the overall design of the stairway, the joints in the wall paneling can be placed so that they align with the posts. Provide for this by ripping the first panel board at the doorway so that the first joint aligns with the post at the foot of the stairway. Cut the paneling to butt against the top and bottom of each tread. Each board will need one notch so that it can slip over the tread above or below the one against which it butts. END

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OPERATION HOME IMPROVEMENT

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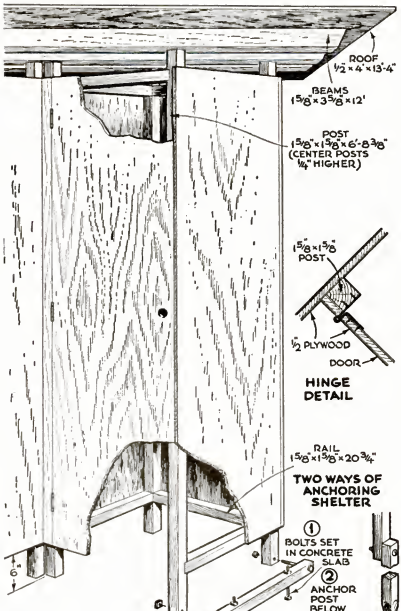
The Greatest Name in Building

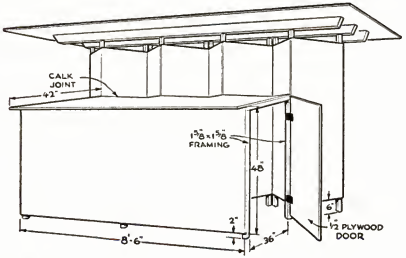
Show Place Garden Shelter

[Continued from page 106]



TYPICAL CONSTRUCTION DETAILS for main shelter are seen above. Anchor it to ground in one of two ways shown.

OPTIONAL LEAN-TO below, built behind main shelter when latter has all doors at front, will house wheelbarrow and mower. Use ½" exterior plywood on two-by-two frame.



WHAT YOU NEED TO MAKE A SHELTER

8 pc.	½" x 4' x 6' exterior plywood (walls)
1 pc.	½" x 4' x 14' OR
2 pc.	½" x 4' x 7' exterior plywood (roof)
1 pc.	¾" x 4' x 8' exterior plywood (shelves)
3 pc.	2" x 4"s—12' long (roof beams)
8 pc.	2" x 2"s—14' long (posts)
6 pc.	2" x 2"s—8' long (rails)

6 pairs of hinges, 4 friction catches, galvanized nails, glue and paint as desired.

them so that two-by-two wood anchor strips can be attached both to the bolts and the legs of the shelter. Anchor the shelter in this way between not less than four pairs of legs.

For greatest strength set the two-by-two rails into dadoes cut ⅜" deep in the corner posts. Assemble with glue and galvanized nails. Rails are required only at top and bottom of the two sides and back panel of each compartment. When the framework is complete, nail on the panels.

Toenail the posts to the roof beams and for wind security screw a mending plate in place across each joint.

A slight slope from side to side in the roof panel will give good rain drainage. Provide for this by making the centerline of eight posts ¼" longer than those at the outside, or by nailing a strip of ¼" plywood on top of the middle roof beam.

Bow the roof panel downward, nailing it to the beams. If plywood 14' long is not available, use two 4'-by-7' panels with a rabbeted joint at the center. Seal the joint with calking compound.

Although unsupported plywood panels can be used as the doors, you can get the jump on any warping tendency by attaching a strengthening frame of one-by-twos inside each one. END

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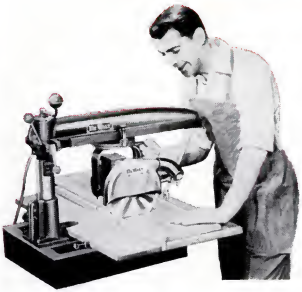
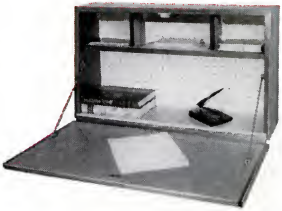
makes a wall desk





in one evening

does everything — easier, finer, safer

Simply draw saw across boards to cut to size. See your mark *and* your cut, A. Turn motor and taper-rip both side boards at once, B. Mount dado head and groove where required, C. Shaper head molds desk edge, D. And you have a smart wall desk, ready to erect!

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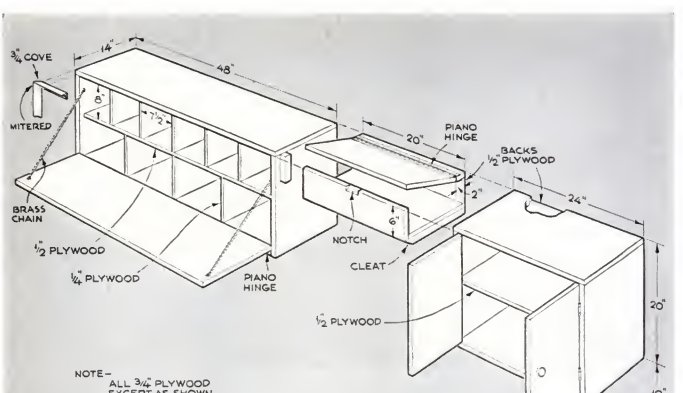


The hang-on-the-wall vanity dresser consists of three units that go together as shown above.

Show Place Vanity Dresser

[*Continued from page 107*]

the back panels of ½″ plywood. Glue and nail ¾″ cove or other suitable molding to the exposed edges of the ¾″ plywood, mitering the molding at the corners.

Drill two vertical lines of holes inside each end of the 24″ cabinet. Use pegs in these to support one or more adjustable shelves. Dado the ends of the long cabinet for the shelf. Also dado the shelf and cabinet top and bottom for the dividers. Stop all shelves and dividers ¾″ short of the front to allow the doors to close.

After mounting the two end cabinets, cut the vanity parts and install. Attach the mirror with contact cement, or with molding nailed in place. END

Show Place Furniture

[*Continued from page 120*]

ness. For the longer furniture, order mattress-type foam rubber cut to size.

The upholstery is your choice. The builders of the original furniture, with pets and children in mind, chose a fabric-backed plastic material that can be wiped clean.

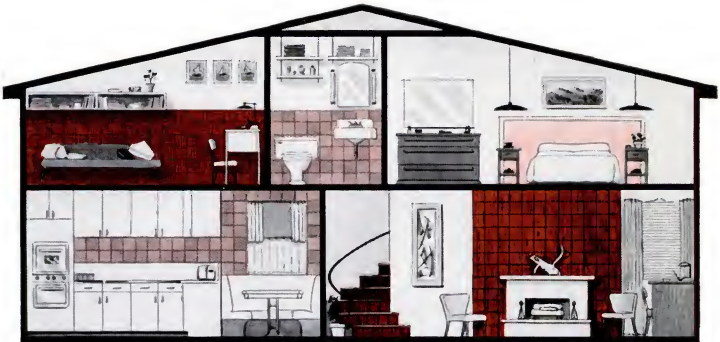
The finish. Place fabric over the hardwood framing below the seat cushions—or leave it exposed and apply a natural finish.

For a finish on the visible wood parts—the frame, the legs and the back-supporting uprights—the builders tried two methods, both attractive. One was just two coats of water-white lacquer. The other was a single coat of white resin sealer brushed on, then gently wiped off when half dry.

Can you build the furniture with hand tools? The answer is yes.

Power equipment will make your job easier, but the construction is so simple that you can safely attempt it with just a few basic hand tools.

[Continued on page 254]



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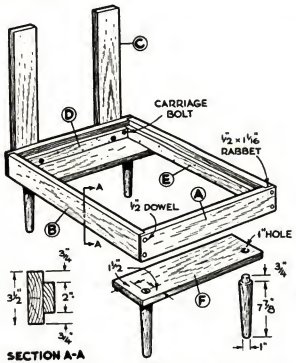
How you make the basic frame [Continued from page 252]



PARTS FOR THE CHAIR BASE

2 pc.	1-1/16" x 3½" x 21" hardwood (A)
2 pc.	1-1/16" x 3½" x 26⅞" hardwood (B)
2 pc.	1-1/16" x 3½" x 22" hardwood (C)
2 pc.	¾" x 2" x 17¾" pine (D)
2 pc.	¾" x 2" x 27⅞" pine (E)
2 pc.	¾" x 5⅝" x 18⅞" pine (F)
4 pc.	2" x 2" x 8⅝" hardwood (legs)

CUT THE HARDWOOD pieces, rabbet each end of the front and back pieces and assemble with glue and ½" dowels. After the glue has set, nail in the 2"-wide inner frame pieces, centering for a ¾" margin top and bottom.

GLUE AND WEDGE legs into 1" holes. Round legs can be bought or lathe-turned. Or taper all four sides of 2"-by-2" hardwood and glue in a 1" dowel. Cut a wide kerf for the wedge.

ATTACH LEG ASSEMBLIES under the frame with No. 8 flathead screws and glue. For the sofa, make three leg assemblies and attach them front-to-back, centering the middle assembly.

LOCATE AND DRILL two ¼" holes like this in the back frame member for the back uprights. For the sofa, position these holes 12¾" and 15½" from the rear corners of the frame.

CLAMP UPRIGHTS over frame holes, locating 1⅞" from corner. Drill from inside to match holes. Bolt on uprights with 3" carriage bolts.

[Continued on page 256]

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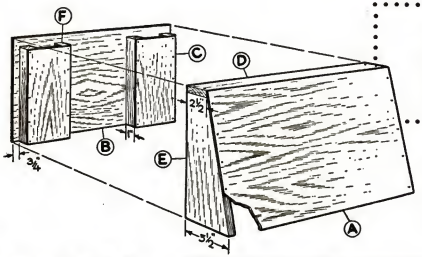
**Table extensions and stand extra. Prices higher in the West and Canada; subject to change.*

TORO

TORO MANUFACTURING CORPORATION • MINNEAPOLIS 6, MINNESOTA

How you make the back [Continued from page 254]



PARTS FOR THE CHAIR BACK

1 pc. ¼" x 12" x 21" plywood (A)
1 pc. ¼" x 11¾" x 21" plywood (B)
2 pc. ¼" x 5¼" x 11" plywood (C)
1 pc. ¾" x 2⅝" x 21" pine (D)
2 pc. ¾" x 5½" x 11" pine (E)
4 pc. ¾" x 1¼" x 11" pine (F)

ASSEMBLE THE TWO SLEEVES first and glue and nail them ¾" from each end of the plywood back panel. If you're building the sofa, attach the sleeve assemblies 11½" from the panel ends.

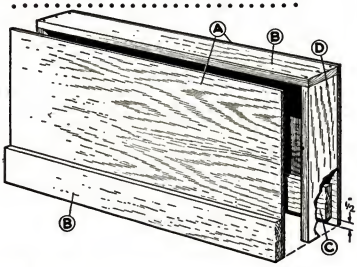
ATTACH THE TAPERED ENDS next. These pieces can be taper-ripped from an 8"-by-11" piece of wood. Make three such pieces for the sofa, placing two at the ends and centering one.

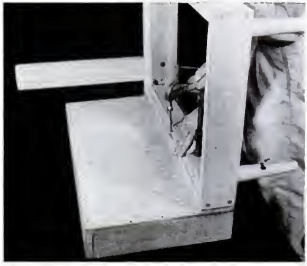
TOP STRIP, 2⅝" wide, goes on. Glue and nail it to the narrow ends of the tapered pieces. Sand or plane its edge flush with the taper. Then attach the front plywood piece.

How you make an arm

PARTS FOR AN ARM

2 pc. ¼" x 15½" x 30" plywood (A)
2 pc. ¾" x 3⅝" x 30" pine (B)
1 pc. ¾" x 3⅝" x 28½" pine (C)
2 pc. ¾" x 3⅝" x 14¾" pine (D)





ARM IS A BOX made from one-by-four softwood and ¼" fir plywood. Butt the 28½" piece of one-by-four (part C) between uprights, raising it ½" from the bottom edge. Fasten arm to base frame with three ¼"-by-3" carriage bolts, centering one and placing others 4" from the ends. Remove arm until the upholstery is on.

[Continued on page 260]

STANLEY STEELMASTER

The Finest Hammer Ever Made

Driving nails is work — no doubt about it. But it's also the kind of clean, thumping exercise a man can enjoy. There's smacking satisfaction in belting a shiny tenpenny into stout 2 x 4 studding. This is the hammer to use . . . for accuracy, authority and pleasure . . . it's the Stanley STEELMASTER, the finest hammer ever made.

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LOCKED-ON HEAD — The head is permanently locked to the handle; it will never come loose.

CHROME ALLOY HANDLE — Special chrome alloy steel handle *will not break!* It flexes a little, it absorbs vibration, but it will not break. Chrome plating prevents rust.

ACUSHNET CONTOURED GRIP — Good-to-the-hand neoprene forms a non-slip, cushioned grip. It won't mar either, so the butt end can be used to tap work into place.

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Introductory extra! Your hardware dealer has free leather holster to keep STEELMASTER within reach when you're working.

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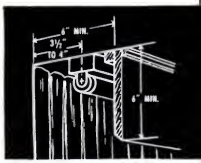
STANLEY THE TOOL BOX OF THE WORLD

3 kinds of wall lighting you can install

HERE'S a way to add new glamor and usefulness to any room. Wall lighting makes low ceilings seem higher, and narrow rooms seem wider. It highlights draperies and pictures. And what's more, it gives just the right soft light for TV-viewing.

LIGHTED CORNICES

attach directly to the ceiling, and give downward light. They are usually installed wall-to-wall, and give the effect of lifting the ceiling. If the tops of your windows are less than 12 inches from the ceiling, cornice lighting is best for you. Try it to brighten a mural or wall mirror. Or to bring out the texture of stone, wood and flock wallpapers. Since all ceilings need some lighting, it's a good idea to supplement cornice lighting with upward light from another source.

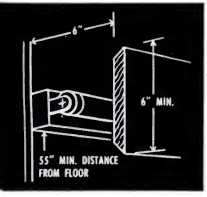


LIGHTED VALANCES

make windows and draperies interesting at night as well as in the daytime. Because they're placed about 12 inches from the ceiling, they wash both walls and ceiling with light. With a lighted valance, ceilings look higher and rooms larger. Rooms will seem sunny and cheerful even on gloomy days. They are most effective installed from wall-to-wall, but can also be used individually over windows and draperies.

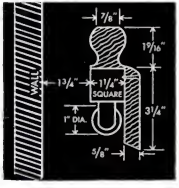
LIGHTED WALL BRACKETS

wash inner walls with light. Use them to balance valance or cornice lighting or as individual centers of interest. Try a lighted bracket in the living room over the fireplace or over a furniture or picture grouping; in the bedroom over a bed or full-length mirror; and in the kitchen over range, sink and work counters.



LIGHTED HANDRAILS

make stairways attractive as well as safe. Use 18"—15 watt deluxe fluorescent tubes, (T-8 type, 1" dia.) on 1¼" x 1¼" white channel with remote ballast. Attach channel to underside of handrail, countersinking sheet-metal screws into channel to hold shield (a standard molding).



WALL LIGHTING FIXTURES have three basic parts. 1) *Ready wired white metal channel* that holds the ballast. Available in standard lengths from your electrical supply dealer. 2) G-E *fluorescent tube or tubes* to fit channel. These vary in length and wattage depending on the size of the channel, and the area to be lighted. De Luxe warm white fluorescent tubes are recommended for most rooms. 3) *Faceboard* to shield tube. Faceboards in a variety of styles can be built with ready-cut stock materials from your lumberyard. You can trim boards with stock or carved moldings or jigsaw your own design. They're attractive, painted to match walls or covered with drapery fabric or wallpaper.

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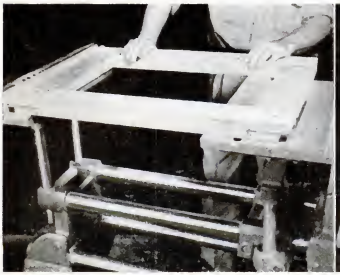
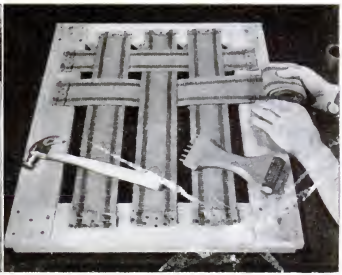
How you make the seat frame

[*Continued from page 256*]

USE TWO-BY-FOURS for the frame, cutting two 20¾" pieces and two 29¾" pieces for the easy chair. (These dimensions allow clearance for the upholstery.) Half-lap the corners, keeping all nails at least 1¼" from the edges.



CUT A RABBET ¾" deep and 1 1/16" wide around the bottom edge of the frame. (A similar rabbet could be formed without power equipment by gluing and nailing narrow strips of ¾" wood under a frame of one-by-fours.)



WEB THE FRAME, using three strips one way and five the other for the chair. A webbing stretcher like that shown helps tighten strips for tacking. Thrust it through the webbing, points up, and rock it back, round end against the frame.

How you apply the cushioning

CUSHION THE BACK by cementing two layers of 1" foam rubber 12" by 21" to the sloping plywood. Then cement a 5"-by-21" piece to the top. Use cement made for foam rubber.

CUSHION ARM by cementing to inner side 12"-by-30" piece of 1" foam rubber. Compress edges as needed. Apply 5⅛"-by-30" piece on top.

[*Continued on page 262*]

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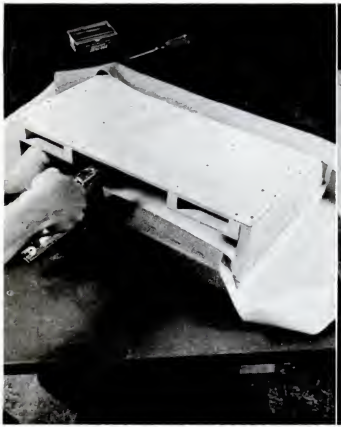
ONLY **SHOPSMITH** LETS YOU COMPLETE THE JOB!

[Continued from page 260]

FOR THE CHAIR SEAT a 4½"-by-20"-by-30" foam-rubber cushion can be used. Brush cement around the edge of the cushion and let it dry. Then wrap upholstery tacking tape around the cushion, letting 1" of the tape width stick up beyond the rubber. Staple or tack the tape to the frame. For the other furniture, cushion the seat with thick foam rubber cut to size.

How you upholster the furniture



USE A STAPLER and attach the fabric like this—or pre-sew an envelope to fit the back or arm and slip it down over. For the back, first staple a piece around the front as shown above.

TACK A BACK PIECE inside-out over top flap, driving tacks through strip of cardboard. Fold fabric down over back and fold edges in flush.

[Continued on page 264]

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Show Place Furniture

[*Continued from page 262*]

FINISH by stapling the edges around the bottom and cutting material away from the supporting sleeves, as above. A plastic with a fabric backing was used on the furniture shown here.

UPHOLSTER THE ARM by folding over a piece of fabric as you did for the back and staple to the outer surface as above. The base of the arm—and that of the back, too—remains uncovered.

TACK ON A SECOND PIECE then, through a stiffening strip; fold it down and staple the edges under the bottom as for back assembly.

STITCH DOWN the folded edges along the outer surface of the arm, using a curved upholstery needle. Stitch the back the same way. END

Show Place Entry Divider

[*Continued from page 109*]

wide. Locate a two-by-two spacer at each end and one at the center point.

The two feet consist of two pieces of two-by-twelve, also cut to fit between the longitudinal frame members.

With the bench frame complete, mount the cabinet. Then cut and fit the two pieces of grooved plywood that form the surface of the bench itself, making the edges of the panel flush with the outer edges of the two-by-twos.

Finish off the edges all around the base with one-by-twos, mitering the corners. Locate the upper edge of the one-by-twos flush with the top surface of the grooved plywood on the bench. At the front, the continuation of this molding strip will then hide the ½" gap between the cabinet bottom and frame.

Install metal standards for the movable shelves, mount the clothes pole and door hardware and apply the finish. END

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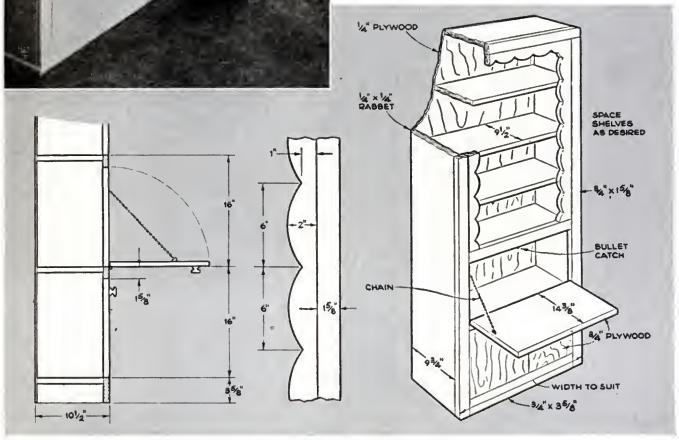
A DROP DOOR on a dining room cabinet makes a handy shelf for the toaster, waffle iron and coffee maker—they're within reach of the table yet the cords are out of your way. When not in use, the appliances are neatly concealed.

Perhaps you already have a buffet-type cabinet that you can adapt. Remove a door or doors, or a shelf, cut a ¾″ plywood panel to fit the opening, mount it with a length of piano hinge and attach a retaining chain. If you don't have the cabinet here's how to build one.

You will need ¾″ plywood for the doors and cabinet sides, ¼″ plywood for the back and 10″ stock shelving. One-by-twos can be used for the facing frame except for the apron—a length of one-by-four stock.

If desired, the shelves can be surrounded by scrollwork, bought already cut—or bandsawed in your own shop to the pattern sketched. Nail this to the one-by-two framing.



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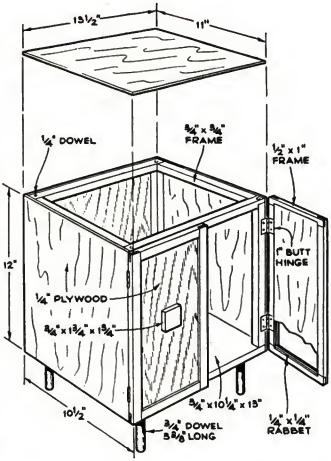
How to build a

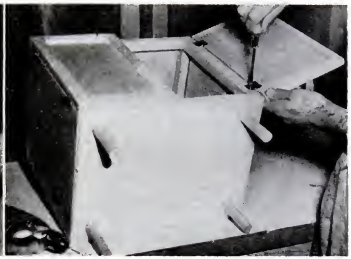
Record Cabinet for Your Child



DOES your youngster have a record player? Are the player and records always scattered around the house?

The top of this cabinet provides a special place to keep a player of the usual size. The records fit inside.

Cut the base from ¾" plywood or cleat together ¾" pine for the width needed. Make the frame of ¾"-by-¾" pine strips, half-lapping the four top pieces. Join the top frame and the base to the four corner posts with glue and ¼" dowels (bottom left photo). Make frames from ½"-by-1" wood for the doors and cut ¼"-by-¼" rabbets to inset a ¼" plywood panel. Drill blind holes ⅜" deep 1⅜" from each corner of the base and glue in the ¾" dowel legs. Bevel the edges of two 1¾"-by-1¾" blocks of ¾" wood and screw them to the doors as pulls.



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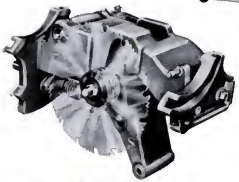

MASSIVE CRADLE, ARM — Heavy box-shape castings for maximum strength. Inside and out the Clausing is ruggedly built.

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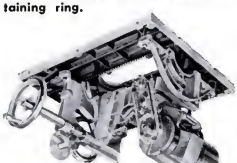

MOST EFFICIENT TILT and HEIGHT CONTROL — In both mechanisms, rack teeth are machine cut cast iron, ¾" wide . . . worms are 1½" diameter steel. 8" diameter handwheels, 4½" diameter tilt dial.

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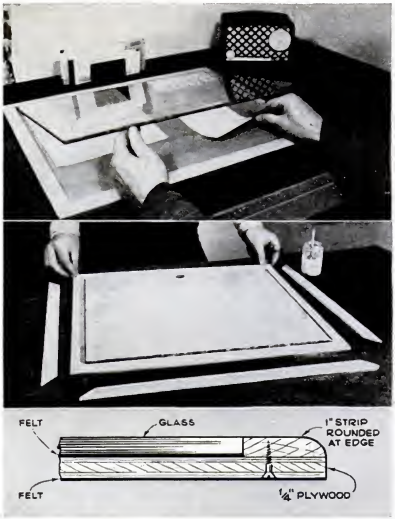
How to make a

Glass-Topped Desk Pad

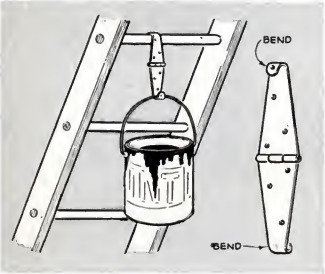


If a glass covering for the full top of your desk at home isn't practical, try a pad with a glass insert like this. It gives a smooth writing surface and keeps reference data conveniently at hand.

Plate glass can usually be bought in an appropriate size, say 18″ by 24″. If you cut it yourself, grind down the sharp edges with a smooth carborundum stone.

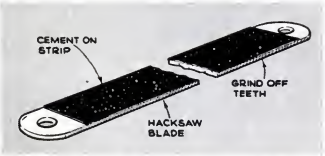
Use a panel of ¼″ plywood as an underlay for the glass, cutting this 1″ greater than the glass all around. Then frame the glass with wood strips as thick as the glass and 1″ wide, mitering the corners. Round off the outer edge of the frame after it has been glued and bradded to the plywood. Drill a 1″ hole through the plywood near the front edge so that the glass can be raised from its recess for access to the papers underneath. Cement strips of felt to the bottom of the base to keep it from marring the desk top.—*Michael Ligocki, Gary, Ind.*

▶▶▶When you must bore a hole in a space where there's no room for a brace, see if you can locate one of those wheel-like handles for a garden faucet. These have a four-sided tapering hole into which the bit shank will fit snugly.



Bent Hinge Holds Paint Pail

Bend the ends of an old strap hinge in opposite directions and you have a good hanger for your paint can while you work on a ladder. Hook one end over a rung, and place the can handle in the other.—*R. D. Rush, Columbus, Ohio.*



Old Blade Is a Flexible Sander

A strip of sandpaper cemented to a hacksaw blade will help you do tricky finishing jobs. The flexible blade will conform to curves. Grind off the teeth first.—*R. G. Cooper, Trenton, Canada.*

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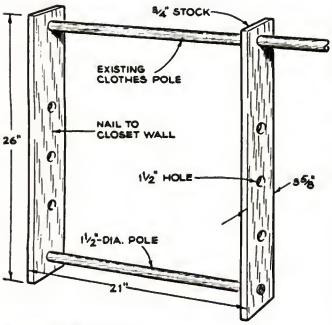
Oklahoma City 1, Oklahoma

Rod Rises as Child Grows

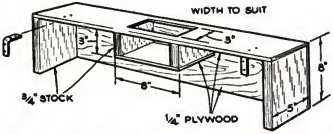
As my daughter grows, we'll be able to raise her clothes-hanger pole right along with her increasing height and longer dresses and coats.

The supplementary hanger was suspended from the existing clothes pole in the closet, and one of the pair of one-by-fours was nailed to the closet wall. Janelle now uses the pole in the bottom pair of holes. When the need arises, it'll take only a minute to pull out the pole and move it up to the higher holes.—*Jean Lyon, Cedar Rapids, Iowa.*



How to Build a Plant Cornice

For an unusual window effect, install a planter cornice and drape a living vine from it. Build the cornice of ¼" plywood with ends of ¾" pine or plywood. Also make the ends and bottom of the receptacle of ¾" material, varying its dimensions if necessary so it will take a lightweight metal planter.



How to Cut Legs Off Level

When it's necessary to cut off the legs to lower a table, chair or other piece of furniture, a mailing tube will help you get a level job.

Measure off the desired leg length on the tube and make a saw cut part way through it at this point. Then slide the tube over each leg in turn and use the kerf on the tube as a guide in sawing off the leg.—*R. M. Woodbury, Natick, Mass.*

IT COSTS LESS TO BE ACCURATE!

BUY LUFKIN

TAPES AND RULES

TO SAVE TIME AND MATERIALS

designed for the *home craftsman*

WHITE CLAD SUPER MEZURALL

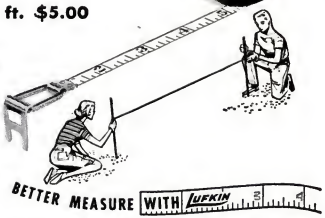
Make difficult measurements unassisted with this heavy duty tape rule. ¾" wide blade extends further unsupported and extra large self-adjusting end hook can be used for hook-over or butt measurements. 16" centers indicated. Bold black markings on snow white blade are easy to read. Top edge graduated in feet and inches to 16ths, bottom edge in consecutive inches. Blades are easily replaceable. Rugged, featherweight, magnesium alloy case. Mezuralls are available in standard ½" wide blades in 6, 8, 10 and 12 ft. lengths. **10 ft. $2.39 12 ft. $2.89**

IDEAL FOR ROOM AND GARDEN MEASUREMENTS

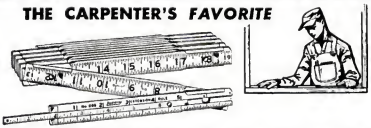
WHITE CLAD BANNER LONG STEEL TAPE

A practical long steel tape at a practical price. Snow white ⅜" wide tempered steel blade with jet black graduations in feet and inches to 8ths. Rugged, rust-resistant welded steel case covered with handsome maroon vinyl. Choice of folding hook ring or regular ring.

25, 50, 75 and 100 ft. lengths. 50 ft. $5.00



THE CARPENTER'S *FAVORITE*



X-46 EXTENSION WOOD RULE

An extra strong rule for heavy duty use. 50% thicker straight grained hard maple sections. Triple locking spring joints with brass strike plates for long wear. 6" fitted brass slide for inside measurements. Bold markings are embedded in wood and plastic coated. **6 ft. $2.50**

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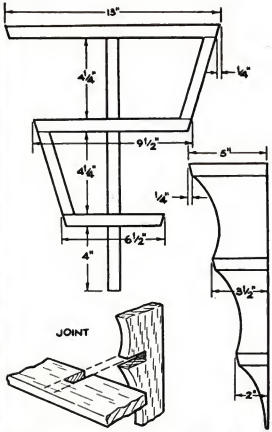
TAPES • RULES • PRECISION TOOLS

THE LUFKIN RULE COMPANY

SAGINAW, MICHIGAN



How to Build a Whatnot for That Bare Space on Your Wall

Here's an offbeat little shelf with an Oriental flavor, attractive enough for almost any room in the house. The piece isn't really difficult to make, but it will test your craftsmanship.

Use any clear ¾" wood. Shape the centered, vertical member from a piece 14¾" long, cutting three easy curves in the front edge as shown in the profile.

Cut slots in it and in the two lower shelves for interlocking, egg-crate joints.

Plane a ¼" bevel on the end and front edges of all shelves, and bevel the ends of the two end pieces to fit between the shelves as shown. Assemble the pieces with glue and nails. Apply a black lacquer or other finish.

Two holes drilled in the back edge of the top shelf will serve to hang the shelf. *—M. C. Anderson, San Lorenzo, Calif.*

Belt Can Keeps Nails Handy

Solder a strip of metal to the bottom of a shallow can, bend it up and solder it inside the top edge to form a belt clip, and you have a handy way to carry nails.

How to Make a Marking Gauge

You can make a marking gauge by thrusting a snug-fitting dowel through an empty thread spool. Drill a fine hole near the end of the dowel for a sharp brad.

Decorate beautifully and economically with

guaranteed PLASTIC WALL TILE

It's guaranteed! Certified dealers who display the emblem can guarantee that materials and installation conform to standards established with the U. S. Department of Commerce, C.S.-168-50, and are eligible for FHA requirements. Insist on the written guarantee!

Designs unlimited with: (1) Regular, (2) King-size, (3) Brick-shape

The Luxury Look of plastic wall tile made of Styron® turns old rooms into bright, new beauties . . . gives them a permanent look of luxury. This lustrous, moisture-proof tile comes in regular and king-size squares and smart new brick-shape . . . and its cheerful, warm colors are styled to match or complement modern appliances and appointments like the translucent reinforced plastic panel shown above. Perfect for bathroom, kitchen, recreation room, hallways.

THE DOW CHEMICAL COMPANY, Midland, Mich.

MADE OF STYRON® A DOW PLASTIC

you can depend on DOW PLASTICS

DOW

Crawl Space into Storage Space

Is THERE a crawl space at least three feet high under a porch or other part of your home? Is it now enclosed by wood latticework?

Confronted by a similar situation, Ralph Wagner of White Plains, N.Y., ripped out the lattice, installed a wall made of concrete and glass blocks, fitted in a small wooden door and now has a convenient storage space for his lawn mower, garden tools and various odds and ends of equipment.

A foundation trench was dug to a depth of two concrete blocks. Nine glass blocks were placed in a line near the top of the concrete-block wall to give light within the enclosure, and the gap above them was closed with a two-by-four. The concrete blocks were finished off on the outside with a stucco facing.

B&D Jig Saw—chosen by professionals!

...complete with 5 different blades to cut most materials!

Zips through metal fast . . . powerful Black & Decker motor lasts for years.

Makes intricate cuts in floor covering, plastics, and compositions.

Makes pocket cuts without lead hole.

Compact, lightweight ...shaped to fit palm. Guides easily.

Cutting line always visible; sawdust blown away.

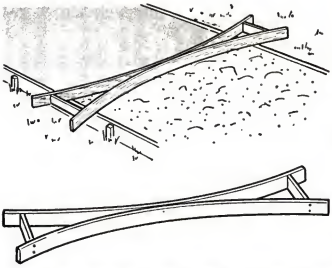
Only $54.50 including blades (coarse tooth, fine tooth, metal-cutting and knife blade).

Versatile, powerful, perfectly balanced...

Does the work of a jig saw, sabre saw, keyhole saw, plus most band saw operations. Plenty of guts to do the toughest, most intricate cutting jobs. Pays for itself on first home project. Powerful B&D-built motor assures rapid feeding speeds, longer life. Backed by Black & Decker's guarantee and nearby factory service. THE BLACK & DECKER MFG. CO., Dept. S-96, Towson 4, Maryland.

Look in the Yellow Pages under "Tools-Electric" for Nearest Dealer

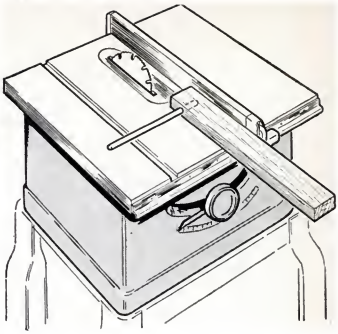
B&D Black & Decker®
PORTABLE ELECTRIC TOOLS



Striker Board Steers Concrete

THINKING of laying a walk or doing a similar concrete job? This bowed striker board will give better results in smoothing the concrete than the customary straight one. The bow keeps the concrete running toward the center instead of spilling over the form sides.

Make the board by nailing together two straight boards at the center. Spring them apart at the ends and nail in wedges.—*S. Clark, East Bradenton, Fla.*



Jig Cuts Dowels to Length

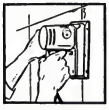
WHEN a number of dowel pins must be cut the same length, drill a hole in the edge of a scrap board as deep as the length required. Make the hole an easy fit for the dowels. Then set the table-saw fence to the width of the jig board. —*Hugh Lineback, Stillwater, Okla.*

Get expert results every time with this Black & Decker No.44 Sander!

Only $52.50 includes sand paper

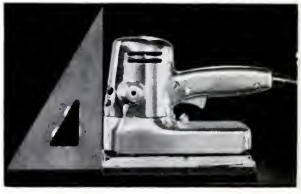
Prepare stairs for refinishing. Sand right up to obstructions.

Refinish book cases, furniture—even antiques.



Smooth walls and plasterboard joints.

NOW . . . do ten hours sanding in an hour! Fast orbital action guarantees professional results the first time. Sands with, across or against the grain. No swirl marks, no uneven cutting, no chance to ruin the job. Satin-smooth finish every time on wood or metal. Perfect balance eliminates vibration for easy handling. Backed by Black & Decker's guarantee and nearby factory service. THE BLACK & DECKER MFG. Co., Dept. S-96, Towson 4, Maryland.



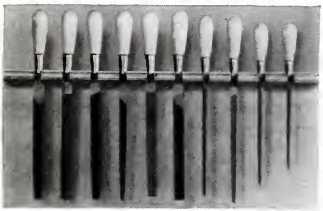
King size bottom plate. Extends beyond housing for close quarter work.

Exclusive paper holder stays open when changing paper.

Look in the Yellow Pages under "Tools-Electric" for Nearest Dealer

B&D Black & Decker®
PORTABLE ELECTRIC TOOLS

Your Nicholson files are fine tools. Proper care will keep them in tiptop cutting condition



Simply constructed file rack is fabricated of strips of wood nailed to a plywood backboard. Ferruled handles make files easier to work, easier to store.

Aside from storing your files separately to prevent dulling, you should keep them free of filings or chips that often collect between the teeth during use. After every few strokes, tap the end of the file on your bench to loosen chips. And always use a file card or file brush before putting the file away.

File card, top, is for more general use. File brush, bottom, combining brush and card, is used especially on finer cut files. Overall length: 10 inches.

Prefinished Nicholson metal ferruled file handles of seasoned hardwood and Nicholson file cards and brushes are available at your hardware dealer's. And if you need a new file . . . for any shaping or sharpening job . . . ask for a Nicholson or Black Diamond file.

Free 49-page book, "FILE FILOSOPHY," is yours for the asking. It's loaded with information on proper selection, care and use of files and rasps.

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NICHOLSON FILES
A FILE FOR EVERY PURPOSE

Things You Never Knew About Your Pen

[*Continued from page 167*]

filling." (Example: "I'm too young to die—I still have 30,000 words left in my Paper Mate.")

The once-discredited ball point made a remarkable comeback. Five years later Paper Mate was selling 30 million dollars' worth of pens a year, 80 percent of all ball points sold in America.

To meet ball-point competition, pen engineers have invented all sorts of new gimmicks to overcome the liquid-feed pen's one obvious disadvantage: the need for frequent, messy refilling from ink bottles. Sheaffer's answer is the "Snorkel." The ink bottle is still needed, but at a twist of the pen's barrel a thin tube snakes out of the point to suck up ink. The penpoint remains dry. Waterman's new cartridge-filled pen, and others' models like it, load much like a ball point. You simply unscrew the barrel and insert a neat, transparent polyethylene cartridge full of regular liquid ink. The Parker 61, just introduced, is the first practical self-filler, forsaking levers and plungers altogether. Just dip it in ink and it drinks its fill automatically, by a reverse application of our old friend capillary attraction.

Liquid lead. Virtually all the old-line fountain-pen makers are now making ball points, too. And Parker and Scripto jointly have developed a "liquid lead pencil" that writes like a ball point. It produces an erasable line indistinguishable from ordinary pencil writing, holds enough liquefied graphite to write as much as a wood pencil five feet long, and bodes ill for the pencil-sharpener industry.

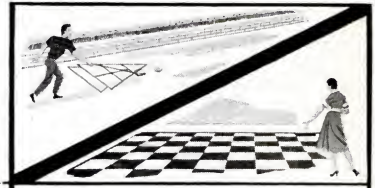
Which will win out—the ball point or the liquid feed? The pen of the future may resemble neither.

"The fountain pen of the future," Waterman's president, Robert D. Howse, told me, "will write for a lifetime without refilling. Super-concentrated dry ink, drawing its moisture from the air at the moment of writing, will make it possible to pack a century's supply of ink into a single one-inch capsule." END

AT LAST MAKE FLOORS, PATIOS, DRIVEWAYS AND WALKS LOOK DIFFERENT— USE ROX©

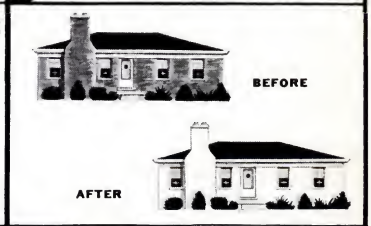
TESTED FOR YEARS

Something *new* and *exciting* in decorating! Now Rox shows you how to design a shuffleboard, a hopscotch block and many other interesting or decorative patterns for porches, basement floors, driveways and patios. See booklet below. If you are tiling your floor, seal out moisture with Rox first. And remember . . . *Rox is guaranteed not to blister or peel.*



BEAUTIFUL, DURABLE EXTERIORS WITH ROX

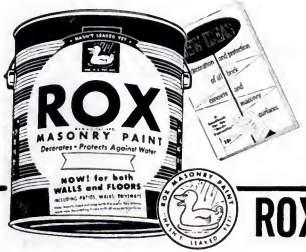
Masonry walls absorb tons of water—this water, if not kept out, can deteriorate masonry. Rox becomes part of the masonry surface itself as it seals this surface and protects against water even in gale driven rains. Rox adds distinctive exterior beauty.



GUARANTEED TO PROTECT BASEMENTS AGAINST WATER LEAKAGE!

With Rox, you can convert your basement to a usable recreation room or workshop where tools are safe from moisture.

Rox is available in 5 colors and white at authorized Rox dealers in U. S. and Canada.



Helpful Booklet Gives Game Diagrams and Beauty Hints

Illustrated in color to help you apply that professional decorator touch as you protect and beautify your basement and masonry surfaces. Diagrams and explanations to make shuffleboard and other games or decorative designs on floors, patios, driveways, walks, etc., and give new interest to masonry walls. Send 15c for handling. © ROX PRODUCTS CO.

ROX PRODUCTS COMPANY

Dept. S7, Detroit 27, Michigan

3 Weldwood® Wizards for the perfect finishing touch!

Whether you prefer the light blond finish, deep mahogany or a painted job, insure the effect you want with a Weldwood finishing Wizard specialized for the job. Developed by United States Plywood, each meets a variety of finishing needs. Keep all three "wizards" on hand.

Pre-seal fir plywood paint jobs with WHITE FIRZITE®

A must for painting fir plywood! As an undercoater, White Firzite is a sealer and primer in one — it seals the pores to help avoid grain raise and checking. And if you want a woodsy blond, pickled, or wiped effect, start with White Firzite to get a real "pro" job without that painty look. (For pastel tones, add colors-in-oil.)

Pre-seal fir plywood stain jobs with CLEAR FIRZITE

Tames wild grain on fir plywood, to rival the subdued beauty of more expensive woods. Helps to prevent grain raise and checking. And for oak, walnut, or mahogany effects, simply add colors-in-oil — it's easy to get the effect you want.

Get that modern natural finish with SATINLAC®

Satinlac emphasizes and protects the natural grain of any wood—hard or soft, plywood or solid lumber. Fast-dry for fast finishing . . . dries out of dust in 3 to 4 hours. Long lasting and a cinch to maintain.

Ask your hardware, paint, or lumber dealer about these Finishing Wizards . . . or mail coupon for FREE leaflets.

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Doctors Endorse This Comic Strip
[*Continued from page 174*]

loons" and letters in the conversations.

The Morgan strip is popular because it is a blend of entertainment and helpful information, Dallis believes. Stressing the human side of medicine, it combines melodrama with the appeal of books on self-help and personality problems.

"People like to learn while they are being entertained," says the 44-year-old psychiatrist.

His first try at a comic strip was 21 years ago with a strip called "The Romance of Medicine." Dallis was still in medical school then, and had "something like Rex Morgan" in mind, he says. But syndicate editors wouldn't buy the idea until 1948.

Dallis applies the same educational-entertainment formula to the Judge Parker strip. He began writing "Judge" in 1952 after he had served for seven years as psychiatric consultant to juvenile and criminal courts in Toledo. This strip is drawn by Dan Heilman of Barrington, Ill., near Chicago.

A relaxed and friendly fellow who will mix you a drink or serve you a cup of tea, Dallis packs 190 pounds on his six-foot frame. He writes whenever he can. Sometimes this is in the evening while his three youngsters romp through the house with their dachshund, Teena. Or, in his study before dawn, he turns out scripts while the house is quiet.

He keeps the story running about three months ahead and works on it in batches of a week of strips at a time. Sometimes the story "goes by itself," and he writes the script for a seven-day sequence at one sitting. Other times it's rocky work and he needs several rounds with one batch. When the story resists him, he goes at it in longhand "to get a better grip." When it begins rolling away again, he takes to the typewriter.

As soon as a batch is done, he airmails it to artist Bradley, who lives and works in Barrington, Ill. Bradley draws the main characters. Klinefelter puts in the "balloons" and lettering. Then these

[*Continued on page 282*]

NOW

–there's a Weldwood® Wizard for every gluing job!

Now there's a whole family of Weldwood Glues — four different types of adhesives — each designed to give you the easiest, quickest, surest answer to a particular gluing job. Be prepared by keeping all four of these "wizards" at your workbench.

Bond instantly, permanently on contact with WELDWOOD CONTACT CEMENT

Great new way to put up plywood panels — without nails — or nail holes to finish. Perfect for applying Micarta and other plastic surfacing materials. 1001 uses for home, hobby, garage — Weldwood Contact Cement holds fast to any combination of wood, rubber, canvas or any other porous surface. 29¢, 40¢, 70¢ and larger.

Make wood-to-wood joints stronger than wood with WELDWOOD *Plastic Resin* GLUE

Pros and hobbyists alike rate it America's most popular wood glue. Weldwood Plastic Resin Glue makes joints that are actually stronger than the wood itself, and keep growing stronger. Economical, easy-to-mix powder. Highly water-resistant, stain and rot-proof. 15¢, 35¢, 65¢ and larger.

For all outdoor gluing—use WELDWOOD WATERPROOF RESORCINOL GLUE

So waterproof it *exceeds* government specifications for marine use! 100% reliable for boatwork; fixing sports equipment such as fishing rods; repairs in basements; making or mending outdoor furniture. Unaffected by climate, weather, water (even boiling, freezing and salt water!), mold, fungus, mild acids, alkalies, etc. ¼ pts., $1.00. Also available in pts., qts., gals.

Weldwood perfects a ready-to-use white glue— WELDWOOD PRESTO-SET® GLUE

Ready to use — sets fast — bonds like magic. So clean and easy to work with for scores of everyday household and hobby purposes. Use this Weldwood-perfected white glue to bond wood, cloth, paper, fabrics, etc., in any combination. Now in easy-to-use plastic dispensers. 19¢, 29¢, 49¢ and larger.

Remember—
There's a special Weldwood Wizard for every gluing job.
Ask your lumber, paint or hardware dealer... or mail coupon for FREE leaflets.

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Send me leaflets on:

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Extra-Handy

...and tough all the way through!

RIDGID

the easy-to-use Bench Pipe Vise

Look at the *more* you get for your money . . . built-in pipe rest aids accurate threading, handy pipe bender . . . Lon-Grip tool-steel jaws hold pipe firmly without chewing it up . . . yoke and base of special last-a-lifetime malleable . . . a bargain in quality!

Buy your RIDGID Pipe Vise at your Hardware Store!

RIDGID Chain Bench Pipe Vise—5 sizes to 8" pipe.

RIDGID
Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U.S.A.

Doctors Endorse This Comic Strip
[Continued from page 280]

strips go back to Toledo, where artist Edgington draws in the details—tables, doors, instruments, scenery, and occasional minor characters. The completed work all goes to Chicago for processing and distribution by the syndicate.

Technical details are checked carefully by Morgan's creators. When he pulls on a sterile rubber glove, Morgan does it in the prescribed medical manner. What he says about specific diseases and about general health problems is as accurate medically as Dallis can make it. Some of Morgan's most faithful followers are medical students and doctors.

Dallis begins each new Morgan adventure without any story plot and with only a general purpose for his hero; to expose a cancer quack, show how an alcoholic finds help, or explore the problems of a girl struck blind. Dallis follows no plan. "I like to be able to let the story go off in any direction, like rabbits."

Dallis has a medical practice of his own. He makes daily hospital rounds, keeps regular office hours from 9:30 to 5:30, and works in house calls on patients on the run.

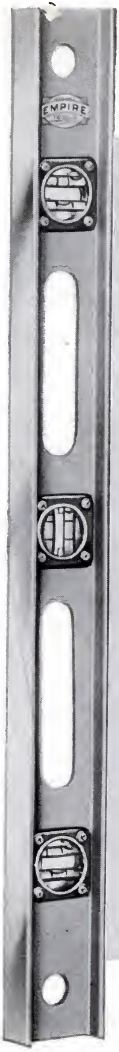
He reads current fiction and medical journals (but no comics regularly). A Rotarian and a school board member, he also works to help elect politicians he favors, takes in the Kentucky Derby, lectures to medical groups over the country, and has even been known to promote prize fighters. Dallis was one of the prime forces in getting Archie Moore a chance to fight the now retired heavyweight champion, Rocky Marciano. His interest in Moore was partly responsible for the appearance of a boxer named Archer Moran in one Morgan episode.

How does he find time to do it all?

His prescription sounds simple enough: "Get yourself involved in situations where more will be expected of you. Then plan your work ahead, concentrate on one thing at a time, and keep relaxed."

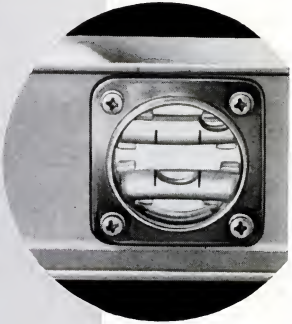
The only son of a Greek immigrant

[Continued on page 284]



You'll read this level faster, easier, more accurately than any level you've ever used . . .

EMPIRE *Magnified Crystal Vision* LEVELS



You get 300% GREATER VISIBILITY with new MAGNIFIED CRYSTAL VISION SIGHTS. Vials are mounted in new "snap-in" holders, between stereoptic *magnifying* lenses, for improved end-to-end viewing. This means more light, more ease and accuracy in reading, with NO SHADOWS, NO REFLECTIONS . . . nothing to obstruct your vision! You can read level or plumb from greater distances and wider angles, even in dim light. And there's no cement or adhesive to shatter loose or dry out.

CHECK THESE FEATURES:

1. 300% MORE VISIBILITY
2. "SNAP-IN" VIAL HOLDERS (PATENT PENDING)
3. VIALS EXPOSED END TO END
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7. LUMINOSITY FACTOR VIAL FLUID
8. PRECISION REPLACEMENT UNITS
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"MAGNIFIED CRYSTAL VISION"

The enlarged photo above shows the unique method of mounting the new Empire vials in crystal-clear *Magnified* shatter-proof lenses. Notice that vial ends are free for easy reading. "Snap-in" holders provide easy replacement of vials, if necessary, by removing four screws.

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[Continued from page 282]

storekeeper, Dallis was born in Manhattan and reared on Long Island, N.Y., at Glen Cove. While attending Washington and Jefferson College at Washington, Pa., he also wrote news stories and drew gag cartoons for college publications. In 1933 he won the eastern intercollegiate middleweight boxing championship. By taking on part-time jobs as a grocery clerk, bartender, fighter, cook, and waiter, he earned money to study medicine.

With a bachelor of arts degree from Washington and Jefferson, Dallis went on to Temple University School of Medicine in Philadelphia where he met and

The nice thing about paddling your own canoe is that it permits you to do the steering.
—THE SIDEWALK SUPERINTENDENT

married Sally Luddy, a nurse. After interning at Washington, Pa., he was at North Community Hospital on Long Island for a year and later in Washington, D.C., as resident obstetrician in Doctors Hospital. After a year of general practice near Temple, Pa., he went to Ford Hospital in Detroit to specialize in psychiatry.

He never forgot his comic strip idea.

When Dallis went to Toledo in 1945 as the new director of the city's mental hygiene center, he became acquainted with Allen Saunders, who was a member of the mental hygiene board. Saunders turns out two syndicated strips, Mary Worth and Steve Roper. He introduced Dallis to the Publishers Syndicate and to artists Bradley and Edgington.

His comic-strip "practice" remained a secret until 1952 when Morgan had become established as a physician of renown. Some of his patients don't know it yet. And if you ask the Dallis children what their father does, the answer is, "He's a doctor." And so he is.

His fictional creations bring him more income than his medical practice. But, like Morgan, Dallis intends to go on practicing—and crusading. END

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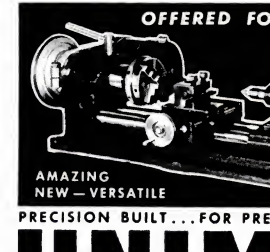

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7. The Jig Saw complete with 12 blades—8. Threading Attachment with ⅜", ½", ¾" NC Thread patterns and formed spacer bit for outward threads—9. Circular Saw complete with 2 blades—10. Indexing and Dividing Attachment complete with table and 3 clamps. All attachments can be ordered individually with the Basic Unit, or at any time in the future! All attachments mount quickly and easily on UNIMAT and increase its versatility even more!

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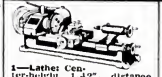
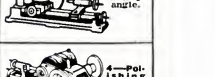
BASIC UNIT



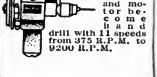
1—Lathe: Center-height 1.42", distance 6.83". Turns between centers and in vertical position using chuck. Base: 14¼" x 3½".

2—Drill Press: Chuck above-table 5" high with 1" stroke. Head-stock pivots, drills holes up to ½" at any angle.

3—Hand Drill: Headstock and motor be-comes a hand drill with 11 speeds from 375 R.P.M. to 9200 R.P.M.



4—Polishing or Grinding: Polishing or grinding wheels on spindle can be pivoted outside of the bed for larger wheels.



5—Tool Grinding: Holds grindstones up to 2.36" Dia. Pintype grinders can be mounted in any position.

6—Milling: Mills slots, grooves, bevels. Permits wide angle work. Prisms milled without extra attachment.

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7—Jig Saw: Easily attaches to base for sawing metal, wood, plastics. Equipped with 12 assorted blades.

8—Threading: Including Tool bit and 3 patterns for ¼", ⅜", ½" NC threads. Other patterns obtainable. **$31.50**

9—Circular Saw: Attaches easily and includes metal and wood saw blades. **$9.50**

10—Indexing Dividing: Includes table and 3 clamps for cutting 2, 3, 4, 6, 8, 12 or 24 toothed gears. **$15.50**

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☐ Basic Unit	$99.50	$49.50	$10.00	$2.50
☐ Jig Saw	10.00	10.00	1.80	.45
☐ Circular Saw	9.50	5.50	.80	.20
☐ Threading	31.50	16.50	3.00	.75
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Inside Our First A-Power Plant

[*Continued from page 184*]

metal tubes stacked upright in a circular checkerboard pattern, a little space between them. Each stands about six feet high and is six inches square. Packed together they form a cylinder six feet across. The uranium is inside them.

Tubes in some inner rows are different from others. A space in the form of a cross extends all the way down through the middle of them.

These tubes are called the seed assemblies. The uranium in them, in the form of plates, has been highly enriched. In other words, it contains much more of the easily fissionable type, U-235, than is found in the natural metal.

Into the cross-shaped spaces fit hafnium control rods which, moving up and down in the tubes, control the speed of the chain reaction.

All the other tubes hold bundles of slender, hollow rods—121 to a bundle—packed with pellets of the coffee-brown oxide of natural uranium. Surrounding the seeds, these tubes are called the blanket.

The U-238 atoms that make up most of the natural uranium in the oxide are not fissionable. But many are converted into plutonium, which is, by the bombardment of neutrons from the seed. For every 100 atoms of U-235 that are fissioned, the designers calculate that 80 atoms of plutonium will be formed from atoms of U-238, to help keep the chain reaction going.

When the Shippingport power station is operating at capacity, water will rush through this assemblage of tubes—the nuclear core—at the rate of 48,000 gallons a minute. It will act both as a moderator and a coolant. As a moderator it will slow down the neutrons released in the fissioning process—and slow neutrons are more efficient than others in making uranium atoms split.

As a coolant, this same water will absorb part of the tremendous heat released when atoms fission. This will raise its temperature to 542 degrees F.

[*Continued on page 288*]

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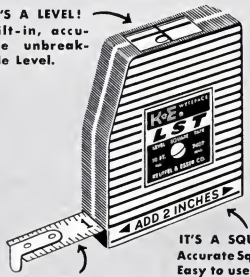

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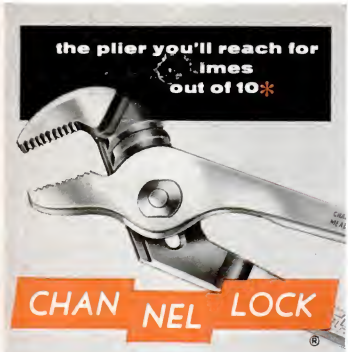

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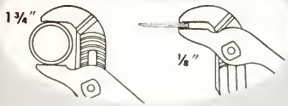

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Inside Our First A-Power Plant

[Continued from page 286]

The superheated water won't turn into steam itself because it's under a pressure of 2,000 pounds to the square inch. (Hence the name for the type of atomic furnace used at Shippingport—pressurized water reactor, or PWR.) From the reactor vessel it rushes into a steam boiler, runs through bundles of tiny pipes surrounded by cooler water, and goes back to the reactor to be heated again. The cooler water absorbs the heat and, being under a pressure of only 600 pounds to the square inch, turns to steam. The steam runs the turbine.

The station's four steam boilers are paired up in two massive cylinders, 100 feet long and 50 feet high. Another great cylinder, 147 feet long, holds a pressurizing tank and other auxiliary equipment.

By utility-plant standards, the steam produced at Shippingport will not be terrifically hot, and some of it will turn to water, which would chew up ordinary turbine blades. Therefore the steam will run through separators that remove much of the water, and the turbine blades have a facing of stellite, an alloy so hard that it can be used in metal-cutting tools.

The most expensive part of the core, oddly, is not the uranium but the stuff that covers it—a dull-gray alloy of zirconium metal. Unlike metallic uranium, the zirconium alloy is highly resistant to heat and corrosion.

Shippingport's $10-12,000,000 load of fuel is designed to give it 3,000 hours of full-power operation. Since the plant will run well under full capacity for a time, this first load should last for several years. Even when the chain reaction runs down, the AEC can reclaim part of the core by chemical processing.

In case of trouble, or for testing, the operators must be able to lift out sections of the nuclear core. And at the end of its useful life they must remove all of it. So a water-filled sectional canal four stories deep and 110 feet long will extend away from the reactor vessel. Riding high above the canal will be a 125-ton

[Continued on page 290]

Famous Antique Shop
uses and recommends
Klean-Strip Paint Remover

KLEAN-STRIP, the non-inflammable paint remover, is used exclusively by Leonard's Antiques, Seekonk, Mass., to restore the beauty of wood heavily coated with paint and varnish. L. C. Leonard reports "KLEAN-STRIP has far exceeded expectations . . . and exceeded results obtained with other removers used. We are sure it's the best."

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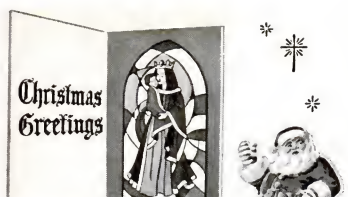

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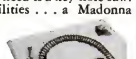

Get your cut-out figures, with Easi-Bild painting pattern and complete instructions attached—or the plain Homasote and pattern — from your local Homasote Dealer. It's real fun making your own Christmas decorations—easy, too—and you always get a professional job. To order patterns alone, or to find the name of your Homasote Dealer, mail us the coupon.

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ADDRESS.....
CITY.....ZONE...STATE.....

Inside Our First A-Power Plant

[*Continued from page 288*]

crane. Special tools dangling from this will grasp the core or any part of it and swing it through the water to a spot in a heavily shielded chamber for examination or storage.

Most of the money for this trail-breaking venture is being paid by the Government—some $85,000,000, much of it for research and development.

But Duquesne, too, is putting up a pretty penny—an estimated $30,000,000. This includes operating costs over a five-year period, and these will be somewhat higher than in the ordinary plant.

What will Duquesne get for its money?

"***Know-how,***" answers Robert B. Donworth, vice-president in charge of engineering and construction.

Thirty or 40 years ago, Donworth explains, it took several pounds of coal to produce one kilowatt-hour of electricity. "We've got that down to well under one pound, but we have gone nearly as far as we are likely to in conventional plant economies.

"We want to find ways to prevent the cost of electricity from going up. The best possibility, over the long pull, is offered by atomic power."

The pull may indeed be a long one. Donworth estimates that in a conventional plant electricity can be produced for about 2¼ mills (a touch under a quarter of a cent) per kilowatt-hour—for coal, labor, maintenance. At Shippingport, fuel alone will cost 3.9 cents per kilowatt-hour, and operating costs add three-tenths of a cent.

But this is for power produced from the first load of fuel. Because of the experience gained from making this one, Shippingport's second core should cost less, last longer and deliver more power. Other costs should go down, too.

Duquesne officials promise that there will be no trade secrets about what is learned. Says Philip A. Fleger, chairman of the board: "Shippingport will be a university, so to speak, for the electric-power industry." END

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"Friendly Home Ideas in Western Pine." 86 photographs, many in color, show you building, decorating and remodeling ideas featuring the cheerful Western Pines. Write to Western Pine Association, Dept. 513-L, Yeon Bldg., Portland 4, Ore.

MORE SPACE!

BUILD IT IN EASILY, ECONOMICALLY WITH CABINETS OF WESTERN PINES

Make your kitchen more useful, more beautiful with handsome Western Pine cabinets. It's *easy* because of the extreme workability of the Western Pines. And it's economical, too!

Your joy for the extra space will be heightened by the rich grain, texture and color of these well-seasoned woods. They are easy to maintain and take all kinds of paint, stain or varnish. Or they can be waxed then rubbed to a silken, natural glow.

Whether you do it yourself or have it done, you'll be happy you chose Western Pines. See your lumber dealer for details.

The Western Pines

Idaho White Pine
Ponderosa Pine
Sugar Pine

and these woods from the Western Pine Mills
WHITE FIR · INCENSE CEDAR
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are manufactured to high standards of seasoning, grading, measurement

Today's Western Pine Tree Farming Guarantees Lumber Tomorrow

[*Continued from page 138*]

every man aboard, air-conditioning, recreation rooms, a fully equipped hobby room, a swimming pool, and an elevator.

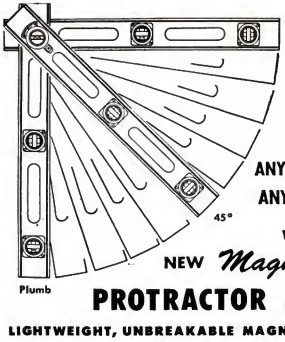
Bigness doesn't always make for comfort, though. At sea, supertankers have shown a tendency to be wet, plowing through waves when loaded rather than riding over them. In foul weather this turns them into a series of floating islands, with the fo'c'sle, bridge, and poop decks sticking up, and the tank decks awash. Catwalks connect the after house and bridge on most of them, but to go all the way forward a seaman generally has to struggle along slippery steel deck plates holding on to an overhead lifeline and praying. Since mess rooms are aft, bridge personnel have long and often wet hikes to chow.

The long days at sea (the *Petrolore* takes more than a month to bring oil from the Persian Gulf to the U.S.A.) aren't lazed away. Besides standing watch and maintaining machinery, there's always corrosion to be fought. Modern tankers have dehumidifiers to help protect the insides of tanks, but the exteriors still have to be cared for with scrapers, wire brushes and paint pots. On the *Petrolore*, there's nearly an acre and a half of main deck alone.

The complement of the *Petrolore* is amazingly small, only 45 men. Several other supertankers carry more than 50, but even that is low compared to the 40 or so on the now-small 16,000-tonners built 10 to 15 years ago. The extra men are not for watch standing but to maintain the ship. The 83,500-tonners will sign on only another four to six men, again to take care of the added surface.

Oil is a tricky cargo to handle, as several accidents have proven. When it's being pumped aboard at the rate of thousands of gallons a minute, valves have to be opened and shut with split-second accuracy. To keep the ships on

[*Continued on page 294*]



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NOW, Magnelite . . . the original extruded magnesium I-beam level . . . is available with an exclusive protractor dial allowing you to measure or set any angle from 0° to 90° . . . with a "quick" setting for ¼" per foot drop. Plumb and level positions feature replaceable vial assemblies with easy-to-read, cat's-eye, pyrex vials behind extra-large glass windows. A highly accurate tool of professional quality, in your choice of 5 sizes . . . 18, 24, 28, 30 or 48-inches.

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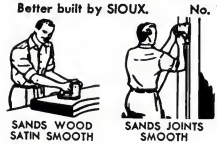
Better built by SIOUX. No. 1850 . . . **$47.80**



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110-120 v. 60 cyc. AC, absolutely the best made—exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted-portable. Powered by an easy starting briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lbs. Regular price $585.00
Special at **$299.50**
Same plant with electric self starter (Item 179) **$359.50**
Generator only and control box (Item 31a) **$169.50**
DUAL VOLTAGE 110-220 available on any of above models (Item 31, 179, or 31a) for $28.00 additional.

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A fastener that grips fixtures to walls quickly, securely...

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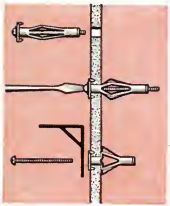
makes any fixture-hanging job a simple task. Fixtures can be quickly removed or replaced when redecorating without disturbing the WALLGRIP. Send for new booklet "The Hang of Things", showing how to fasten all kinds of fixtures to any type of wall.



How WALLGRIPS work in hollow walls:

1. Insert in Hole. Wings spread as bolt is tightened.
2. Positive Stop tells WALLGRIP is set.
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Please send me a FREE copy of the book "The Hang of Things".

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New Supertankers Outgrow Harbors

[Continued from page 292]

an even keel, center tanks are usually filled first, then outside or wing tanks. The switching has to be timed to prevent spillage; a slow man or a sticky valve can result in a 20-to-30-foot geyser of oil.

In filling tanks, allowance must be made for the expansion of cargo under way when the hot sun beats down hour after hour on the tank decks. If too little air space is left, oil will be forced out of overflow pipes and the whole ship may be covered with an oozy, gooey and highly inflammable mess.

Oil vapors inevitably escape from tank vents and glands in pumps and valves, so smoking is forbidden except in living spaces and on the bridge. When on one ship a machinist tightened up on the pumps to keep down seepage, the friction overheated the metal and the whole compartment blew up.

About the only time a dime still is worth as much as ever, is when you have to use it in the absence of a screwdriver.
—THE SIDEWALK SUPERINTENDENT

The regular run of supertankers is a shuttle service from oil field to refinery and back, one way loaded to the marks with crude oil, the other ballasted with sea water to keep the ship seaworthy. The *Petrolore* will attempt to cut down that empty time from 50 percent to around 30. Instead of a shuttle service, her eventual run is planned to be a complete trip around the world. In the Persian Gulf she'll pick up oil to go to Marcus Hook by way of the Cape of Good Hope (loaded she can't fit in the Suez Canal). From Marcus Hook, the next leg is an empty one to Venezuela to pick up iron ore to carry to Japan by way of the Panama Canal. From Japan, she'll go in ballast back to the Persian Gulf. The complete voyage of some 29,000 nautical miles, with loading and unloading time, will take roughly three months, depending on weather. END

Now! a SCREW DRIVER with 4 TIMES THE DRIVING POWER

RATCHET Palm Grip Makes Screw Driving EASY

The Palm-Grip Interchangeable Ratchet snap-fits into the steel sockets of the shock proof plastic handle. The user can change to various size drivers quickly and easily.

The extra radius at the Palm-Grip Ratchet greatly increases leverage, enabling FOUR TIMES the full turning power at the extreme end of the driver. With ratchet removed, Palm-Grip drivers are quality, conventional hand tools.

PALM-GRIP QUALITY TOOLS
A variety of 40 different hand tools fit the Palm-Grip Ratchet. Conventional, Phillips, Frearson and Clutch type screw drivers, also nut drivers and socket adapters. Women marvel at the added power it offers with comfortable grip.

Look for this display at Hardware, Electrical, Auto and Building Supply Stores or write for free descriptive folder.

Palm Grip RATCHET DRIVERS

KIPTON INDUSTRIES, INC.
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It's easy to hang a door

with the NEW McKINNEY

NON-MORTISE HINGE

Simple • Easy • No Chiseling

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3 Finishes: Dull Brass, Nickel or Bonderized Prime Coat
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FASTEST-CUTTING JIG SAW MADE! This powerful new Millers Falls tool is a jig saw, hack saw, coping saw, ripsaw, crosscut and keyhole saw all in one. Makes curved, straight or irregular cuts in wood, metal, all kinds of material—in places often inaccessible to other saws! Exclusive design features and special blades result in far greater cutting speed than any similar saw.

No. 480 Dyno-Mite Electric Jig Saw—$49.50

THEY'RE DYNO-MITE®

FOR THAT PROFESSIONAL FINISH! This new Millers Falls Orbital Sander finish-sands furniture, cabinets, interior trim . . . removes paint, varnish or surface imperfections . . . all without tracking, scoring or burning surface. High-speed orbital action permits sanding with or across the grain. Light weight makes it easy to use on overhead and vertical as well as horizontal surfaces.

No. 580 Dyno-Mite Orbital Sander—$49.50

THEY'RE Millers Falls

Finest Power Tools Made

MILLERS FALLS TOOLS

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Ask for these folders on the whole power-packed line of Millers Falls Dyno-Mite electric tools including the remarkable new Dyno-Mite Power Workshop, or write direct.

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Need more closet space? This one's easy to build. Made from Upson 3/8". Just nail Upson in place and paint. Upson's easy to work, edges sand smooth.

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Upson wall board is perfect for all kinds of do-it-yourself projects. The list is endless: make cabinets, chests, closets, use Upson to finish your basement walls and ceilings, garage, add-a-room. Or make cut-out toys, a model train table. In fact, use Upson like plywood. Only with Upson you save money. Save up to 50% on each square foot you buy. And Upson is easy to work, light, strong. Saws like wood, paints beautifully.

Upson comes in a large variety of thicknesses and sizes. From 1/10", 1/4", 3/16" to waterproofed, super-strong 3/8" for outside use. Pebbled, smooth and striated surfaces. Sizes from 4' x 6' to huge 8' x 20'.

Upson wall board saws easily, edges sand clean, smooth!

There are many imitations, *so ask for Upson wall board by name!*

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UPSON

WALL AND CEILING PRODUCTS SIDING, SHEATHING

UPSON

99% new spruce wood fibers laminated for great strength

THE UPSON COMPANY, LOCKPORT, NEW YORK

Volkswagen Races 858 Miles

[*Continued from page 149*]

We changed seats twice before crossing Ohio's eastern border at 2:53 p.m. and collecting our card at the gateway to the Pennsylvania toll road, the grandpappy of all of today's high-speed turnpikes. Here, too, the passenger-car speed limit was 65.

At four p.m., near Pittsburgh, we called it a day and sought a motel. We had averaged almost 48 miles an hour for 488 miles of turnpike, including our stops. For 303 miles of turnpike, including stops, we had done a little better than 53 miles an hour.

"Mmm," said Luckett. "Not bad!"

But the Continental had beaten our time across Ohio, and the advantage we had gained getting onto the Ohio pike had shrunk to 27 minutes.

We were up early the next day. A stitched and quilted overcast hid the sun. The tank took 9.8 gallons. Our gas economy had dropped to a shade more than 28.7 miles per gallon.

"Not so good," I said.

"We had crosswinds and headwinds," replied Luckett defensively. "Hard ones, too."

He had mounted an alarm clock on the lip of the glove compartment.

"So I can tell the time," he explained. "All that I can make out from that wrist watch of yours is that it's high tide in Honolulu."

Now we were in the Alleghenies. Crowns of hills notched the horizon as we topped one rise after another. The VW labored. Luckett, driving, discovered that if he advanced toward an easy grade at 64 miles an hour (70 indicated) and held the throttle on the floorboard, the speedometer needle clung there. If he slacked off, he couldn't regain his speed. On the long maximum grades (three percent), the VW would drop from 64 to as low as 47 in fourth gear. Shifting into third helped sometimes, but it did no good above 55 indicated.

On the downgrades we had to take that right foot completely off the throttle

[*Continued on page 298*]

Kean Kutt says...

SHARK BRAND SWEDISH CHISELS MAKE HARD JOBS EASY because of...

A MORE DURABLE EDGE

Shark Brand Chisels undergo a special super hardening process which is applied not only to the cutting edge, but is carried two-thirds of the way up the blade. This means longer life for the chisel because it can be sharpened over and over again without losing its edge holding qualities.

. . . but there's more to why Shark Brand Chisels outlast and outperform ordinary chisels . . . Ask for them at your hardware dealer now!

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FP33 HOME FLOOR CONDITIONER

The world's most popular style floor conditioner

Counter-rotating brushes mean perfect floor conditioning with a finger-tip touch. Eliminates all drudgery from scrubbing, waxing, polishing, buffing. Will steel wool dirt and grime from wood and all floor surfaces.

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How to Maintain Wood Floors. Illustrated instructions on polishing, cleaning, varnishing, waxing and sanding wood floors.

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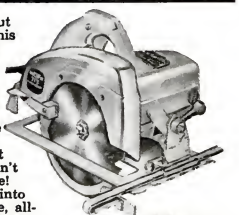
with Cummins® portable power tools!"

Built of Waldwood Plywood — a product of United States Plywood Corporation.

"We built this good-looking Serving Table-Cart ourselves — and it's an original Russel Wright design you can't buy anywhere! Your Cummins dealer has the simple plans — and the Cummins power tools to do the job right, the easy way!"

Make *every* cut required for this Serving Table-Cart with Cummins MAXAW . . . quickly, easily, accurately! Exclusive True Course Guide assures straight cuts so you can't saw off the line! Slip MAXAW into sturdy, oversize, all-steel MAXAW 777 Saw Table — make precision bevel, miter, crosscut or rip cuts. Get Serving Table-Cart plans at your Cummins dealer now.



MAXAW 717
6¾" blade cuts 1⅞" at 45° angle $49.95

MAXAW 777 SAW TABLE
Converts MAXAW into tilt arbor table saw in seconds! Equals cutting capacity of 8" table saw . . . weighs 46 pounds without saw $39.95

Other Cummins MAXAWS priced to $79.95.

Prices slightly higher in Canada.

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5055 N. Lydell Ave., Milwaukee 17, Wis.

( ) Enclosed is 25c in coin. Please send me the Cummins-U. S. Plywood "Famous Designer Plan" for Russel Wright's Serving Table-Cart.

( ) Please send me information on the other plans available in your "Famous Designer" series.

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See your Gold Bond dealer today for all the materials you need.

*COST BASED ON MATERIALS ONLY SPREAD OVER 36 MONTHS. PRICE VARY SLIGHTLY IN SOME LOCALITIES

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BUILDING PRODUCTS

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Please send Gold Bond's "How-to-Do-It" Plan #19 with step-by-step directions for building an attic room. Enclosed is 10¢ to cover mailing.

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Volkswagen Races 858 Miles

[Continued from page 296]

to get any compression braking. We were bothered, too, by the small glass area in the back. It created two big blind spots. The hills, road repairs and the Penn pike's seven tunnels, where the posted speed is 35 miles an hour, cut into our average. But fewer stops helped. By the time we reached the Delaware River Bridge, marking the end of the Penn toll road, we were covering 55 miles each hour.

The VW has no gas gauge. Back in Chicago we had been told: "Just run off the main tank until you're out of gas. Then turn this valve—there's a reserve tank—and you'll have enough fuel for 40 miles more. That will get you to a gas station."

The main tank had run dry 10 miles short of the bridge. We had no warning. The engine just quit. We had been sitting there, waiting for it, but when it happened we both jumped. I switched to the reserve.

"Forty miles?" asked Luckett.

"Forty," I confirmed.

As we left Pennsylvania and wheeled onto the New Jersey Turnpike, we had lost eight additional minutes to the Continental, slicing our total time advantage to 19 minutes.

The gas supply bothered me. We had put 14 miles on the reserve before we saw a sign: it would be 24 miles more to the first filling station. If the man in Chicago was right, we had a meager two-mile fuel cushion.

"Let's live dangerously," said Luckett.

He was driving now, and he nursed the throttle on the downgrades. The clock and the odometer ticked on.

"Forty," said Luckett.

"Forty," I said.

Then it happened. The car went *whaaaa,* gasping, and lapsed into a stark silence. The reserve had lasted for exactly 26 miles. We rolled off into the shoulder of the road, put out the white handkerchief and raised the hood.

[Continued on page 310]

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ALUMINUM NAILS

Thousands of uses in and around the house . . . in your workshop . . . on all your projects. *RUSTPROOF — no unsightly streaks or stains.* Hi-Temper solid aluminum alloy — easy to drive. Last indefinitely. Wide choice of sizes and types (including file grip and screw thread) . . . on your dealer's counter.

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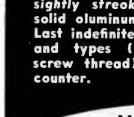
Automatic Saw Set...



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Model "31" AC WELDER

Made to order for...

HOME SHOPS
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Useful, Dependable, High Quality

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HOME WORKSHOP
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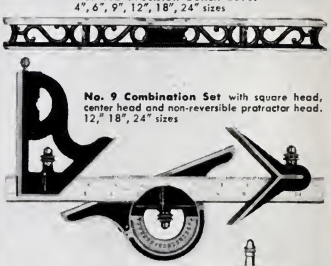
No. 132 Precision Bench Level 4", 6", 9", 12", 18", 24" sizes



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No. 800 Square Head Nail Sets. Five point sizes — 1/32" to 5/32"

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No. 604-R Steel Rules, 1" to 72" lengths, 8ths, 16ths, Quick Reading 32nds, 64ths
No. 439 24" Combination Tool—seven useful tools in one
No. 47 6" Universal Bevel
No. 92 Dividers 6" to 9"
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No. 108 Aluminum Line Level
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No. 111 Stair Gage Fixtures
No. 470 Hexagonal Stair Gage Fixtures

No. 87 Mercury Plumb Bob
No. 99 Popular Priced Transit
No. 101C Leveling Instrument
No. 999 Leveling Rod and Plastic Target
No. 554 "Eyeglass" Screw Driver
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SAFE-FLEX High Speed Hole Saws

FREE Starrett Catalog displaying all these and many more Starrett precision tools, tapes, hacksaws, band saws and band knives. Write Dept. P.S.

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Athol, Massachusetts, U. S. A.

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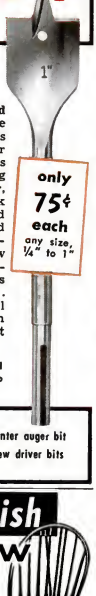

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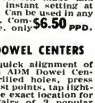

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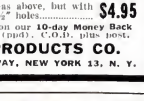

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ITEM #417

The Vickers model V-2129-FL11 is actually two hydraulic pumps on a common shaft.

The large hydraulic pump is rated at 21 G.P.M., 1000 lbs. P.S.I. at 1200 R.P.M., for conventional hydraulic system and the small pump is rated at 3 G.P.M. and 1000 lbs. P.S.I. for power steering or for second hydraulic system. Rotation counterclockwise.

Use them individually or collectively.

Dimensions: 13⅝" Long X 9" in diameter with 1" shaft, 1½" inlet port and 1⅝" outlet port on large pump. 12" inlet port and ¾" outlet port on the small pump. Shipping Wt. 66 lbs. Worth $212.50. Now priced below the value of the smallest pump! !

F.O.B. Chicago **69.50**

GROBAN SUPPLY CO. Dept. PS-9
1139 S. WABASH AVE., CHICAGO 5, ILL.

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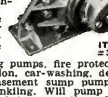


ITEM #384

These all bronze Centrifugal Pumps are ideal for use as marine bilge pumps, circulating pumps, fire protection or irrigation, car-washing, dewatering, basement sump pumping, lawn sprinkling. Will pump water, oil, brine, gasoline, DDT and sulphur compounds. Equipped with 6" adjustable V' pulley, 2" dia. inlet and outlet, 180 GPM capacity. Inlet and outlet take hose with 2½" inside diameter. Dimensions: 11" x 8" x 11".

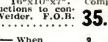
Total head-feet	Speed	H.P	GPM
25	3600 RPM	3	180
35	3600 RPM	11	90
20	3400 RPM	1½	75

Back plate may be rotated for most convenient inlet position. Gov't acquisition cost $96.00. Shipping weight 31 lbs. F.O.B. Chicago **29.50**

300 AMP. D. C. GENERATORS

IDEAL FOR WELDING GENERATOR

ITEM #91



Type R-1, rated 300 Amps. — 30 Volts. Mfd. by Jack & Heintz. Government Acquisition Cost $380.00. Ship. wt. 55 lbs. Dimensions: 16"x10"x7". Complete with instructions to connect as Welder. F.O.B. Chicago **35.00**

ITEM #90 — When connected as a welder, this unit will deliver 200 amps for a sustained period and 250 amps for intermittent service. This generator is widely used for shop-built portable welders. Rated 200 amps, 28 volts, 2500 R.P.M., using 10 H.P. Dimensions: 15" L. x 6" W. x 8½" H. Splined drive shaft. Gov't. Acq. cost $300.00. Ship. Wt. 51 lbs. F.O.B. Chicago..... **22.50**

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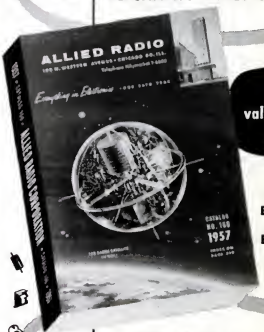

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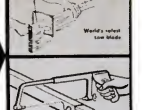

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Volkswagen Races 858 Miles

[Continued from page 298]

"This is great," I said. "This is just fine. Now we haven't got a ghost of a chance of beating the Continental's time to New York. The Volkswagen let us down."

"It's the other way around," responded Luckett. "You're going to let the Volkswagen down—if you don't subtract this time out from your total. You subtracted time out for the overnight stop, didn't you?"

Well, there were two ways of looking at it. I felt better.

Before the fuel truck arrived a lot of time passed. By the time we got the engine started again, we had been idle for 47 minutes.

It was two p.m. before we paid our toll at the northern end of the New Jersey Turnpike. We were now only 16 minutes ahead of the Continental's time. And we hit traffic. I chafed.

It was 2:09 when finally we scooted onto the George Washington Bridge. Two minutes later we had crossed from the New Jersey to the New York side.

I looked at Luckett's alarm clock and checked the odometer. We had covered 858 miles since leaving Chicago's South Side. Our total driving time, including fuel and food stops—but deducting the time out with the dry tank—had been 17 hours, 11 minutes.

The Continental had required seven minutes longer.

But we had snitched an advantage of 12 minutes at the very start by setting off from South Chicago instead of from the Loop, and at a time when traffic was light. The real, conclusive difference in time was in the length of the food-fuel stops. The Continental stopped for a total of an hour, 47 minutes, the Volkswagen for only an hour, 12 minutes.

As we drove into the steel-and-concrete canyons of New York, with the sun striking fire off its minarets, Luckett had one last observation.

"You know," said he, dreamy-like, "I wonder how long you have to wait to get one of these things. . . ." END

NEXT MONTH:

PSM's Hi-Fi Fair

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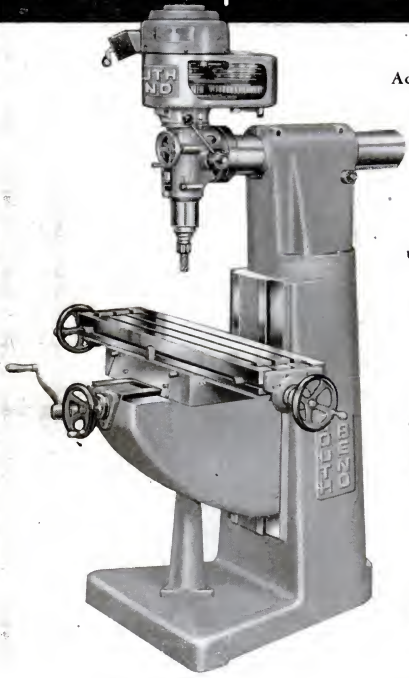

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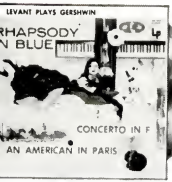

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